

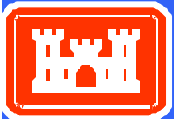
Public Information Workshops

Proposed 2001 Willamette Reservoir Operations

March 13, 2001 - Springfield

March 14, 2001 - Sweet Home

March 15, 2001 - Stayton



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of Engineers

Meeting Overview

- ✍ Normal Reservoir Operating Criteria*
- ✍ Special Operations for Endangered Species*
- ✍ Review of Operations Last Year*
- ✍ Proposed Reservoir Operations this Year*
 - ✍ Current Conditions*
 - ✍ Flow Forecasts for the Remainder of 2001*
- ✍ Answer Questions/Receive Comments*



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of Engineers

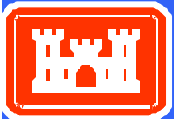
Foster Lake Planned 2001 Operations

*✍ Drawdown for Juvenile Steelhead
Migration*

✍ April - May

✍ Reservoir Refill by 25 May

*✍ Reservoir Clearing Prior to Labor Day
Weekend*



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of Engineers

The Willamette Reservoirs -- System Overview

- ✍ System description*
- ✍ Authorized project purposes*
- ✍ Endangered species consultation*
- ✍ Rule curves*
- ✍ Operating Criteria During the Conservation Season (Feb-Oct)*
 - ✍ Longstanding Operational Criteria*
 - ✍ Recent Criteria*



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of Engineers

Willamette Basin Project, Oregon

13 Dams and Reservoirs

- 11 multiple-purpose
- 2 reregulating

Over 100 Miles of Bank Protection works

Navigation Channel, Mouth to Corvallis (135 miles)



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of Engineers

Authorized Purposes

-  *Flood Control*
-  *Hydropower*
-  *Navigation*
-  *Irrigation*
-  *Fish & Wildlife*
-  *Recreation*
-  *Water Quality*
-  *Municipal & Industrial*



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of Engineers

Endangered Species Listings in the Upper Willamette Basin

- ~~Spring Chinook~~*
- ~~Winter Steelhead~~*
- ~~Bull Trout~~*
- ~~Oregon Chub~~*



US Army Corps
of Engineers

Willamette Basin Project ESA Section 7 Consultation

✂ Action Under Consideration:

- ✂ Continued operation of 13 Corps reservoirs*
- ✂ Willamette Bank Protection Program*

✂ Action Area:

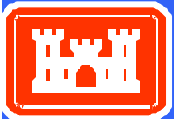
- ✂ Willamette River & major tributaries on which projects are located*
- ✂ Lower Willamette & Columbia Rivers influenced by flows*



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Willamette Basin Project ESA Section 7 Consultation

- ✍ Joint Consultation: NMFS & USFWS*
- ✍ Multiple-Species Evaluation*
 - ✍ All Fish, Wildlife and Plants Currently Listed or Proposed for Listing Under Federal ESA*
 - ✍ Focus on Aquatic Species (Salmon, Steelhead, Bull Trout & Oregon Chub)*
- ✍ Status*
 - ✍ Preliminary Draft Biological Opinion*

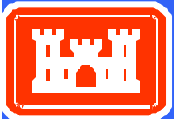


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Willamette Basin Project ESA Section 7 Consultation

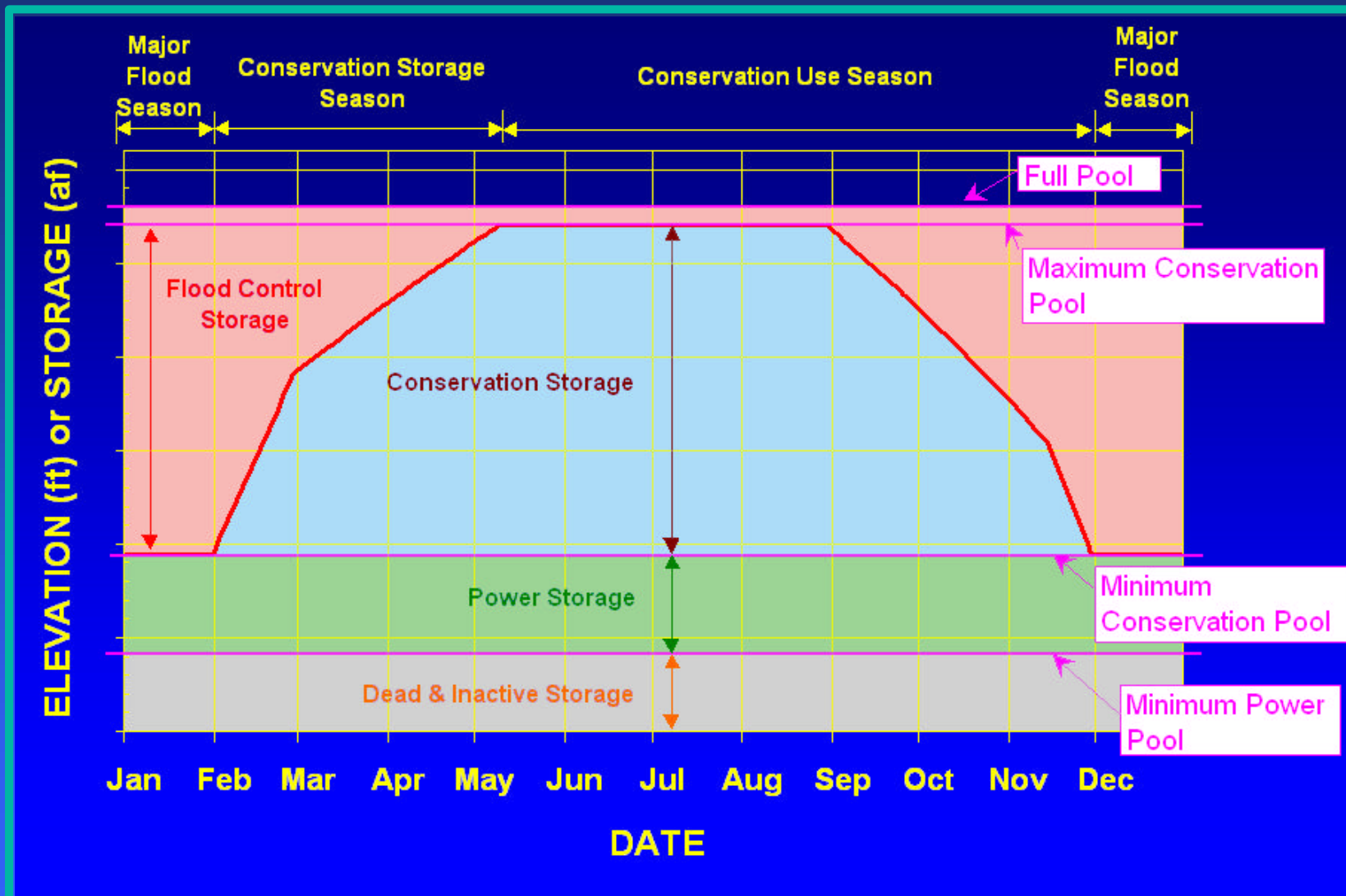
Categories of Potential Conservation Measures

- ✂ Flow management (Minimum Spring Flows)*
- ✂ Temperature Control Facilities*
- ✂ Fish Passage Improvements*
- ✂ Downstream Habitat Restoration*
- ✂ Nutrient Replenishment*
- ✂ Large Woody Debris Replacement*



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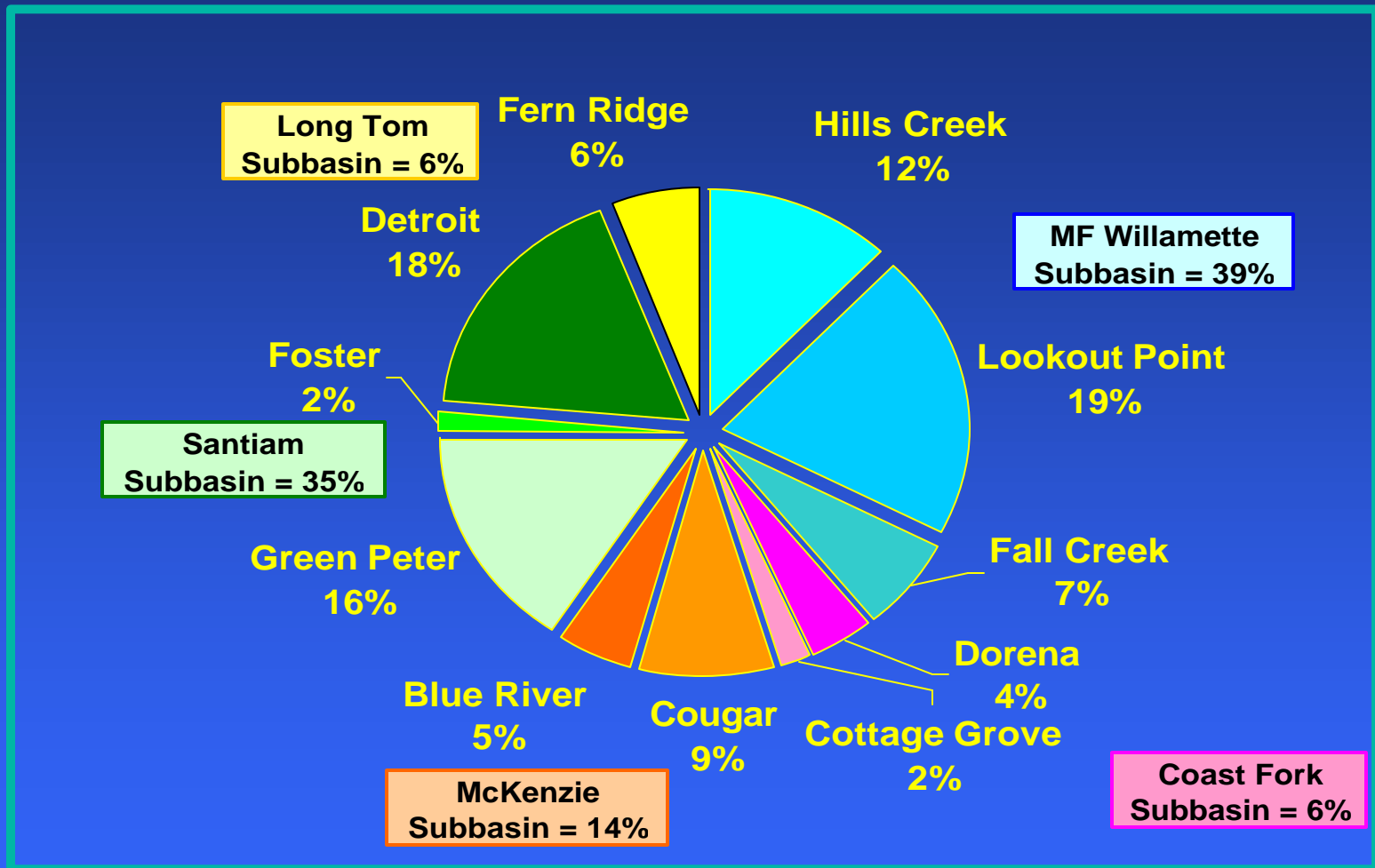
Multi-Purpose Reservoir Water Control Diagram



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Willamette Conservation Storage

Total = 1.6 million Acre-feet



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Willamette Reservoir Projects Conservation Season Operating Criteria

Historic Operating Criteria

-  Minimum Instream Flows*

-  Mainstem Flow Augmentation (Jun-Oct)*

-  Water for Out-of-Stream Needs*

-  Drawdown Priorities*

New Criteria for Endangered Species

-  Spring Fish Flow Thresholds (Apr-Jun)*

-  Hold Lookout Point full for Oregon Chub*



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Minimum Tributary Flows for Fish, Water Quality & Recreation

(June - October)

 Hills Creek	300 cfs	 Blue River	50 cfs
 Lookout Point	1,000 cfs	 Fern Ridge	30 cfs
 Fall Creek	30 - 150 cfs	 Green Peter	300 cfs
 Cottage Grove	50 cfs	 Foster	800 cfs
 Dorena	100 cfs	 Detroit	1000 cfs
 Cougar	300 cfs		



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Willamette Reservoir Projects Conservation Season Operating Criteria

✂ Historic Operating Criteria

✂ Minimum Instream Flows

✂ Mainstem Flow Augmentation (Jun-Oct)

✂ Water for Out-of-Stream Needs

✂ Drawdown Priorities

✂ New Criteria for Endangered Species

✂ Spring Fish Flow Thresholds (Apr-Jun)

✂ Hold Lookout Point full for Oregon Chub



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of Engineers

Mainstem Flow Augmentation for Fish Habitat & Water Quality

(June - October)

✎ Albany - 5,000 cubic feet per second (cfs)



✎ Salem - 6,500 cfs



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of Engineers

Willamette Reservoir Projects Conservation Season Operating Criteria

Historic Operating Criteria

-  Minimum Instream Flows*
-  Mainstem Flow Augmentation (Jun-Oct)*
-  **Water for Out-of-Stream Needs***
-  Drawdown Priorities*

New Criteria for Endangered Species

-  Spring Fish Flow Thresholds (Apr-Jun)*
-  Hold Lookout Point full for Oregon Chub*

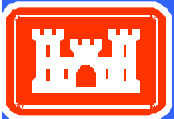


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Out-of-Stream Uses of Stored Water

✍ 57,000 Acre Feet for Irrigation

✍ Currently No Municipal and Industrial Use



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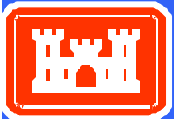
Willamette Reservoir Projects Conservation Season Operating Criteria

✍ Historic Operating Criteria

- ✍ Minimum Instream Flows*
- ✍ Mainstem Flow Augmentation (Jun-Oct)*
- ✍ Water for Out-of-Stream Needs*
- ✍ Drawdown Priorities*

✍ New Criteria for Endangered Species

- ✍ Spring Fish Flow Thresholds (Apr-Jun)*
- ✍ Hold Lookout Point full for Oregon Chub*



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Reservoir Drawdown Priorities

(April -October)

First: Lookout Point

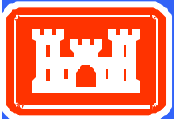
Second: Cougar

Third: Blue River

Fourth: Hills Creek

Fifth: Fall Creek, Cottage Grove,
Dorena, Green Peter



Last: Fern Ridge, Foster, Detroit



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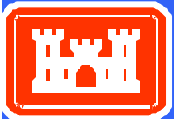
Willamette Reservoir Projects Conservation Season Operating Criteria

Historic Operating Criteria

-  Minimum Instream Flows*
-  Mainstem Flow Augmentation (Jun-Oct)*
-  Water for Out-of-Stream Needs*
-  Refill and Drawdown Priorities*

New Criteria for Endangered Species

-  **Spring Fish Flow Thresholds (Apr-Jun)***
-  Hold Lookout Point full for Oregon Chub*



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of Engineers

Spring Fish Flow Thresholds

- ✍ Supports Juvenile Steelhead and Adult Chinook Migration*
- ✍ Studies by ODFW Show Increased Survival Under Higher Spring Flows*
- ✍ Requested by National Marine Fisheries Service in Their Draft Biological Opinion*

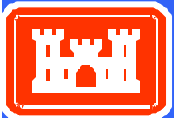


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Spring Fish Flows

<u><i>Period</i></u>	<u><i>Thresholds</i></u> [*]
<i>Apr 1 - Apr 15</i>	<i>20,500 cfs</i>
<i>Apr 16 - Apr 30</i>	<i>17,800 cfs</i>
<i>May 1 - May 31</i>	<i>15,000 cfs</i>
<i>June 1 - June 15</i>	<i>13,000 cfs</i>
<i>June 16 - June 30</i>	<i>8,700 cfs</i>


**** Weekly Average flows; may be scaled back during dry years***



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Willamette Reservoir Projects Conservation Season Operating Criteria

Historic Operating Criteria

-  Minimum Instream Flows*
-  Mainstem Flow Augmentation (Jun-Oct)*
-  Water for Out-of-Stream Needs*
-  Refill and Drawdown Priorities*

New Criteria for Endangered Species

-  Spring Fish Flow Thresholds (Apr-Jun)*
-  **Hold Lookout Point full for Oregon Chub***



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of Engineers

Lookout Point -- Oregon Chub Special Operations

Objective:

-  *Hold Lookout Point Lk. at Full Pool Through 15 July*

Purpose:

-  *Protect Oregon Chub Spawning Habitat in Small Protected Embayments Around the Lake Margin*

Impact:

-  *Shifts Drawdown Priorities for Meeting Downstream Flow Targets to Other Reservoirs*



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The Challenge of Low Flow Years

- ✍ Low Water Conditions Occur an Average of 2 Out of Every 10 Years***
- ✍ Separate Strategies are Essential to Deal with Low-Flow Years***



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of Engineers

Proposed Salem Flow Adjustments

<i>TIME PERIOD</i>	<i>FULL TARGET FLOWS (cfs)</i>	<i>REDUCED TARGET FLOWS (cfs)</i>
<i>Spring/Early Summer Fish Flows</i>		
Early April	20,500	16,400
Late April	17,800	15,000
May	15,000	15,000
Early June	13,000	11,700
Late June	8,700	7,800
<i>Summer/Fall Flow Augmentation Targets</i>		
July	6,000	5,500
Early August	6,000	5,500
Late August	6,500	6,000
September	7,000	6,500

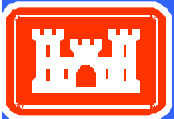


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of Engineers

Year 2000 Willamette Operations

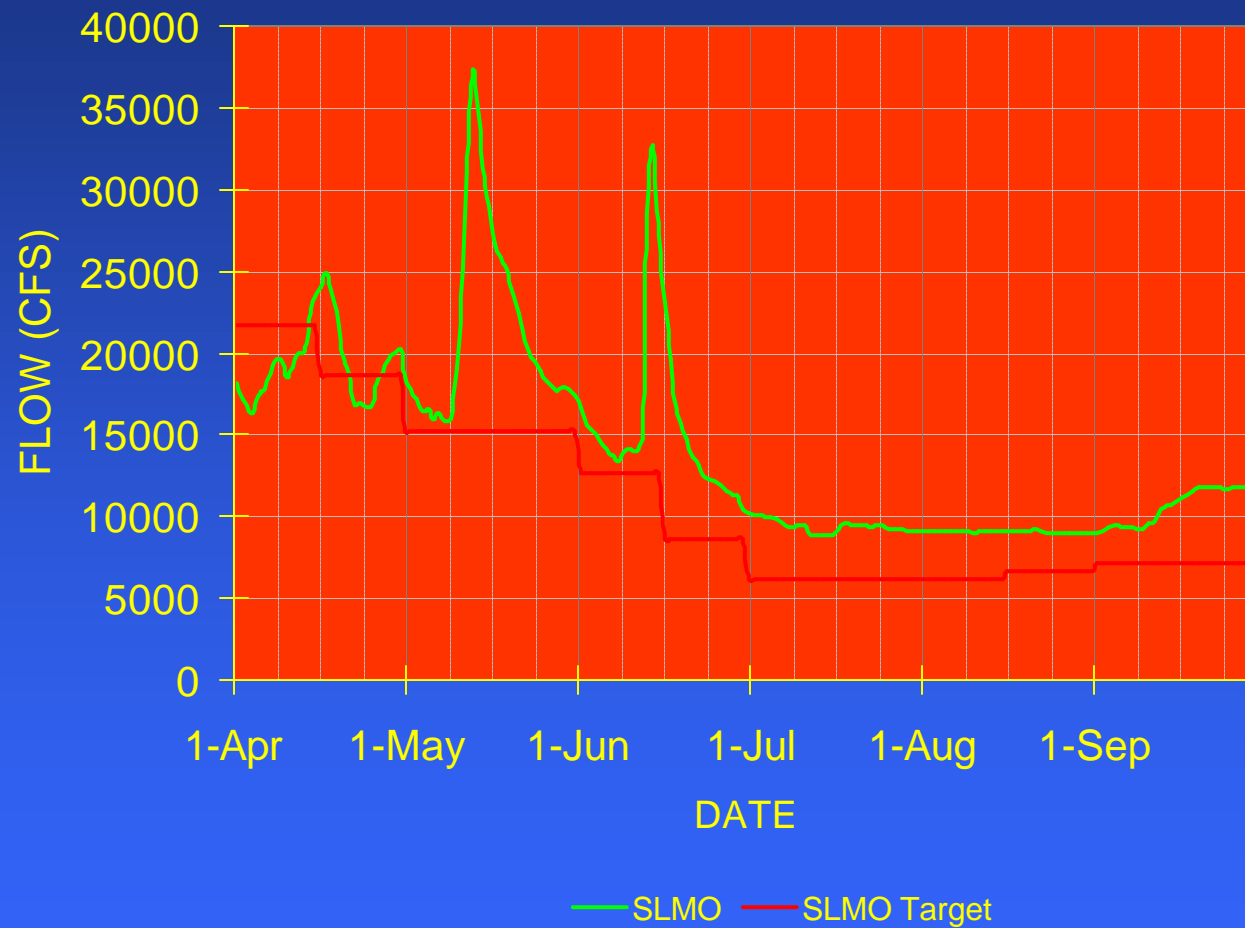
 Last Year's Operations

 Current Reservoir Conditions



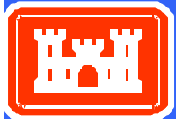
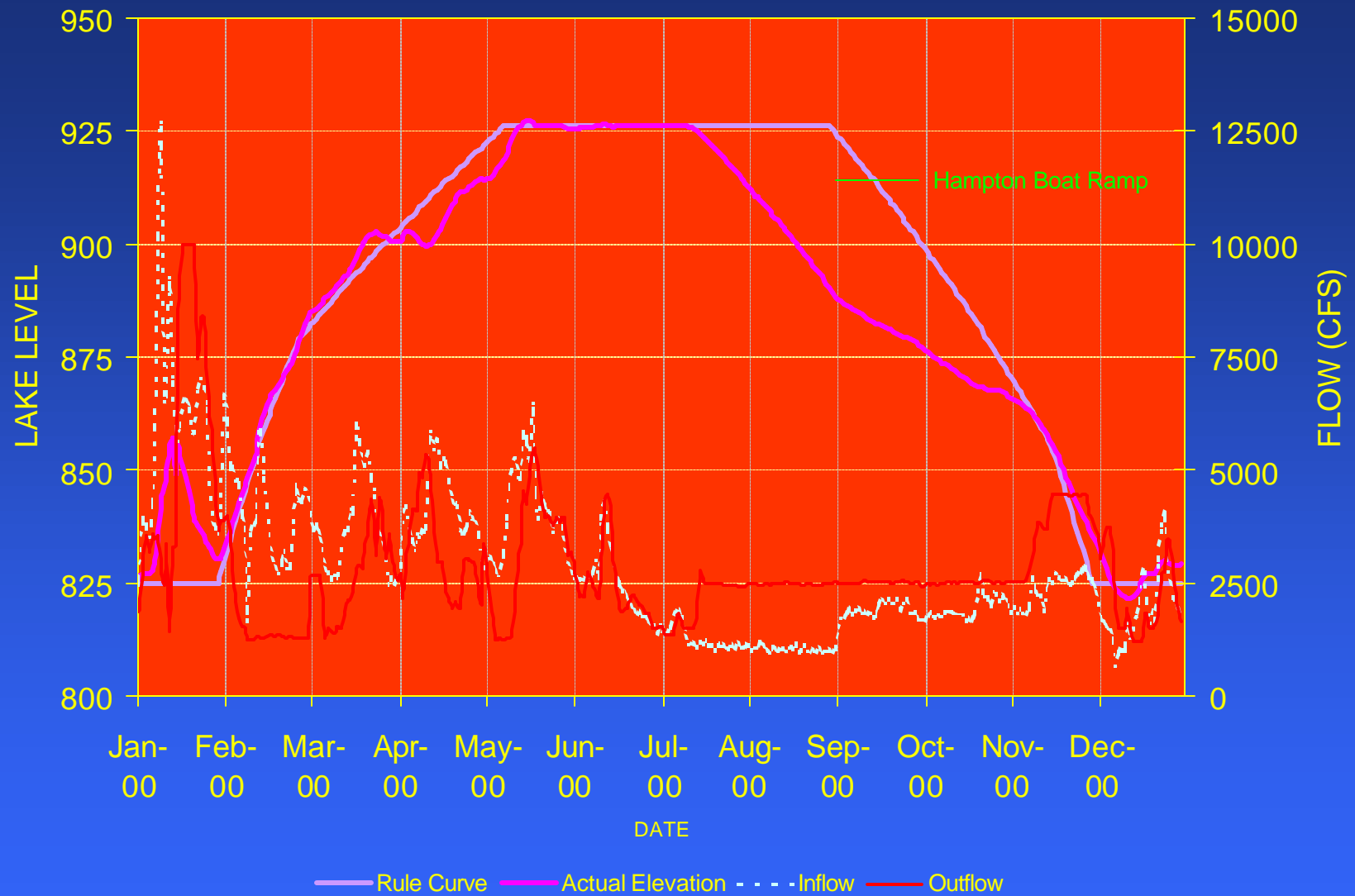
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2000 FLOWS MEASURED AT SALEM



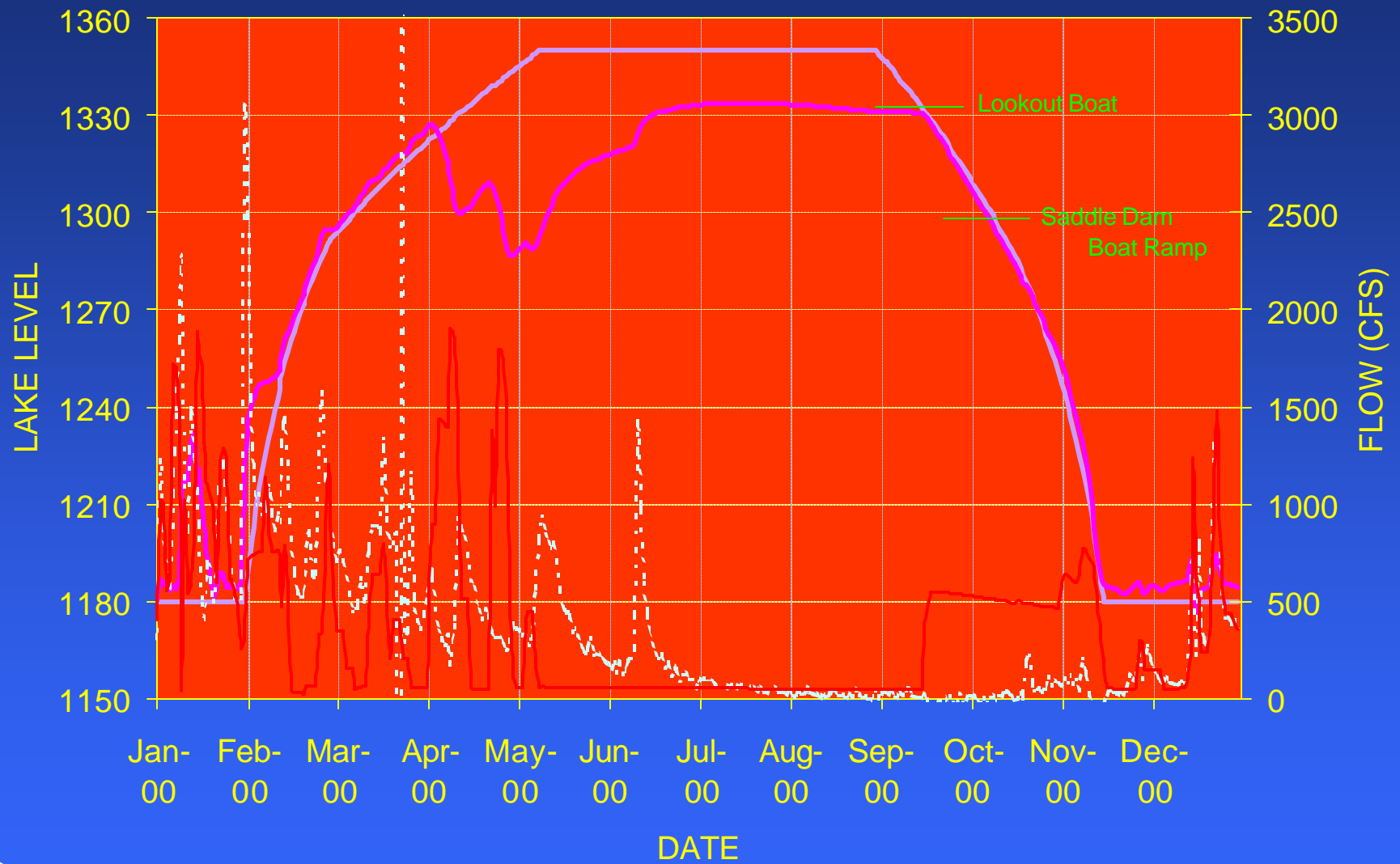
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of Engineers

LOOKOUT POINT



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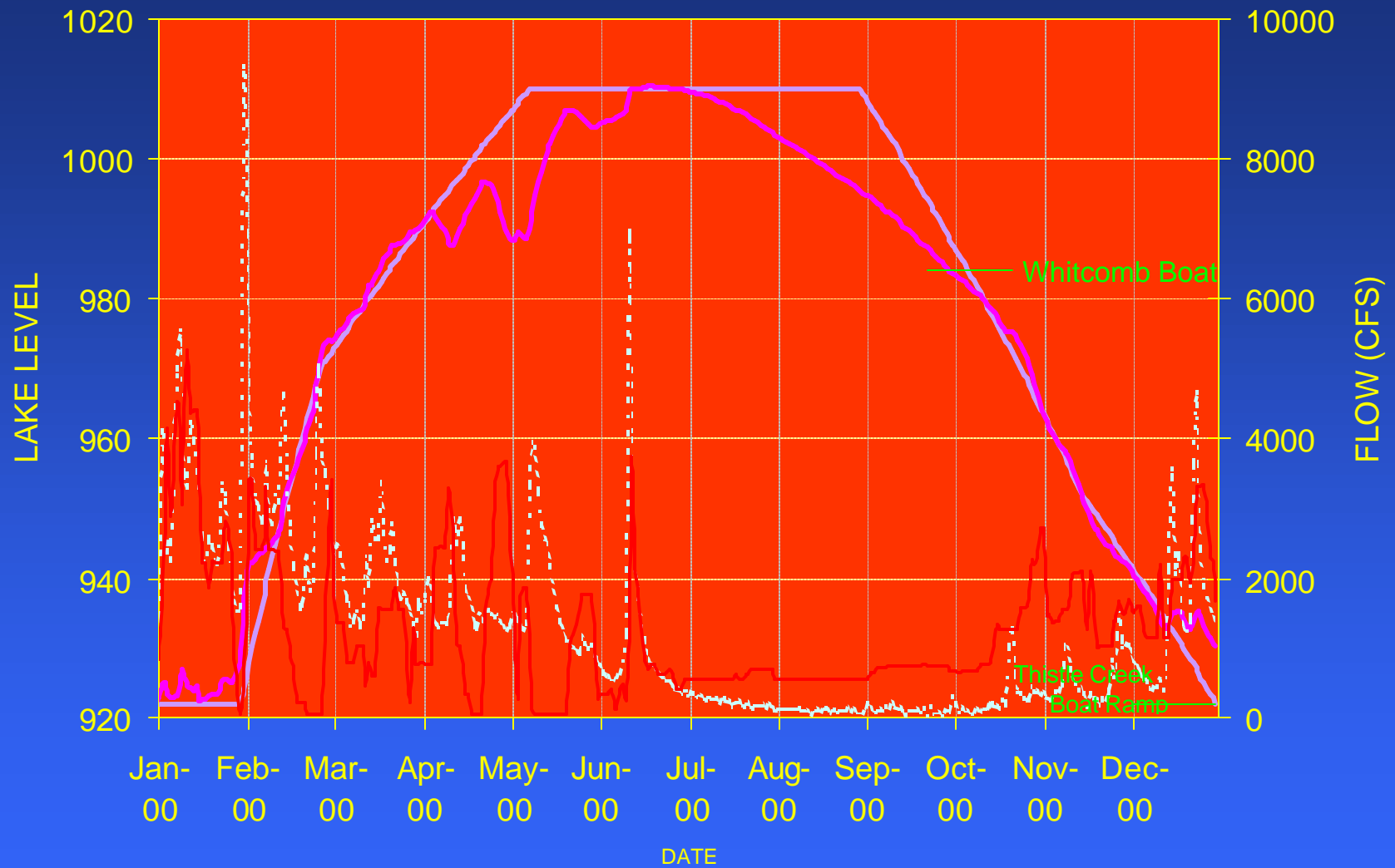
BLUE RIVER



US Army Corps
of Engineers

— Rule Curve — Actual Elevation - - - Inflow — Outflow

GREEN PETER

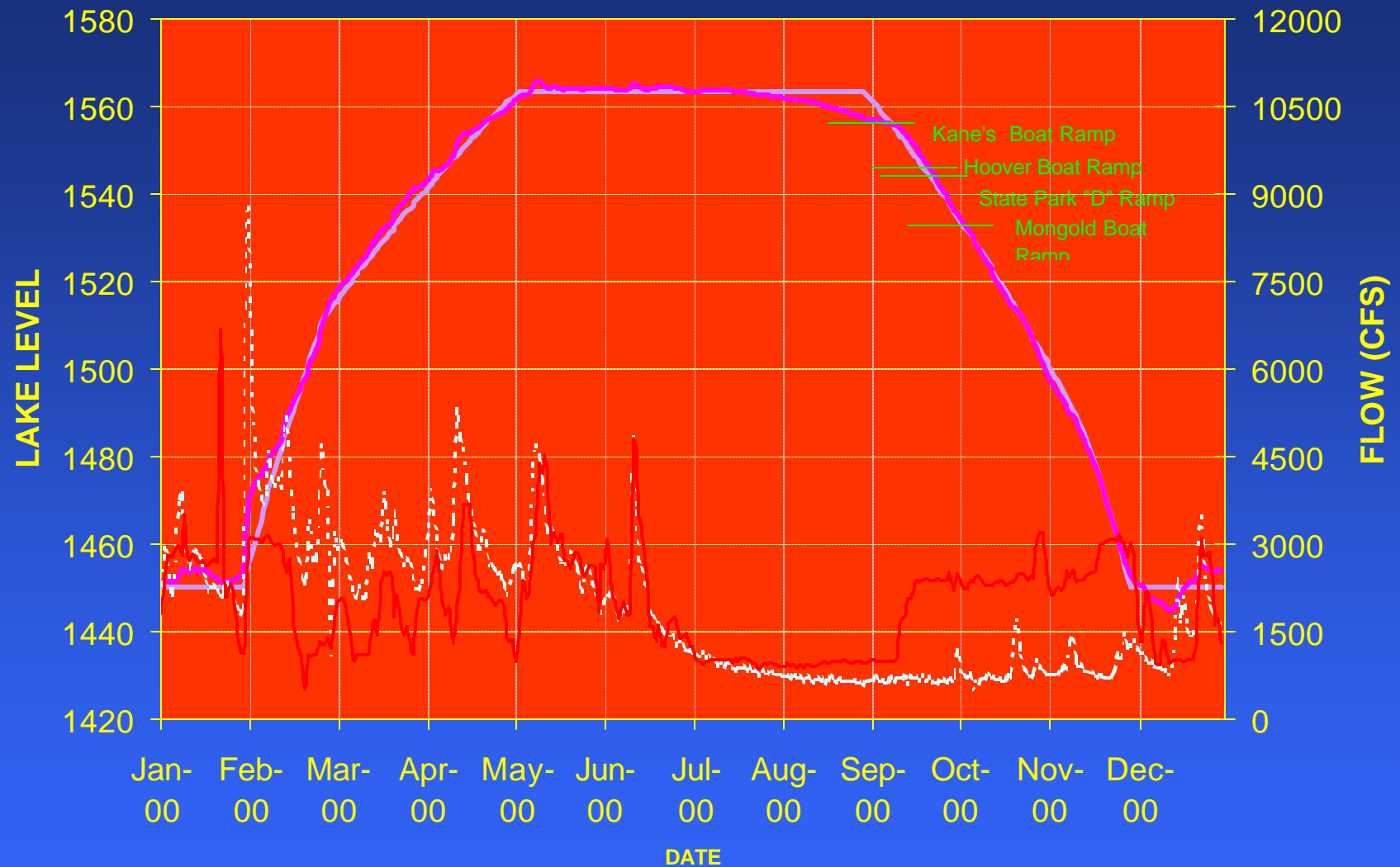


— Rule Curve — Actual Elevation - - - Inflow — Outflow



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DETROIT

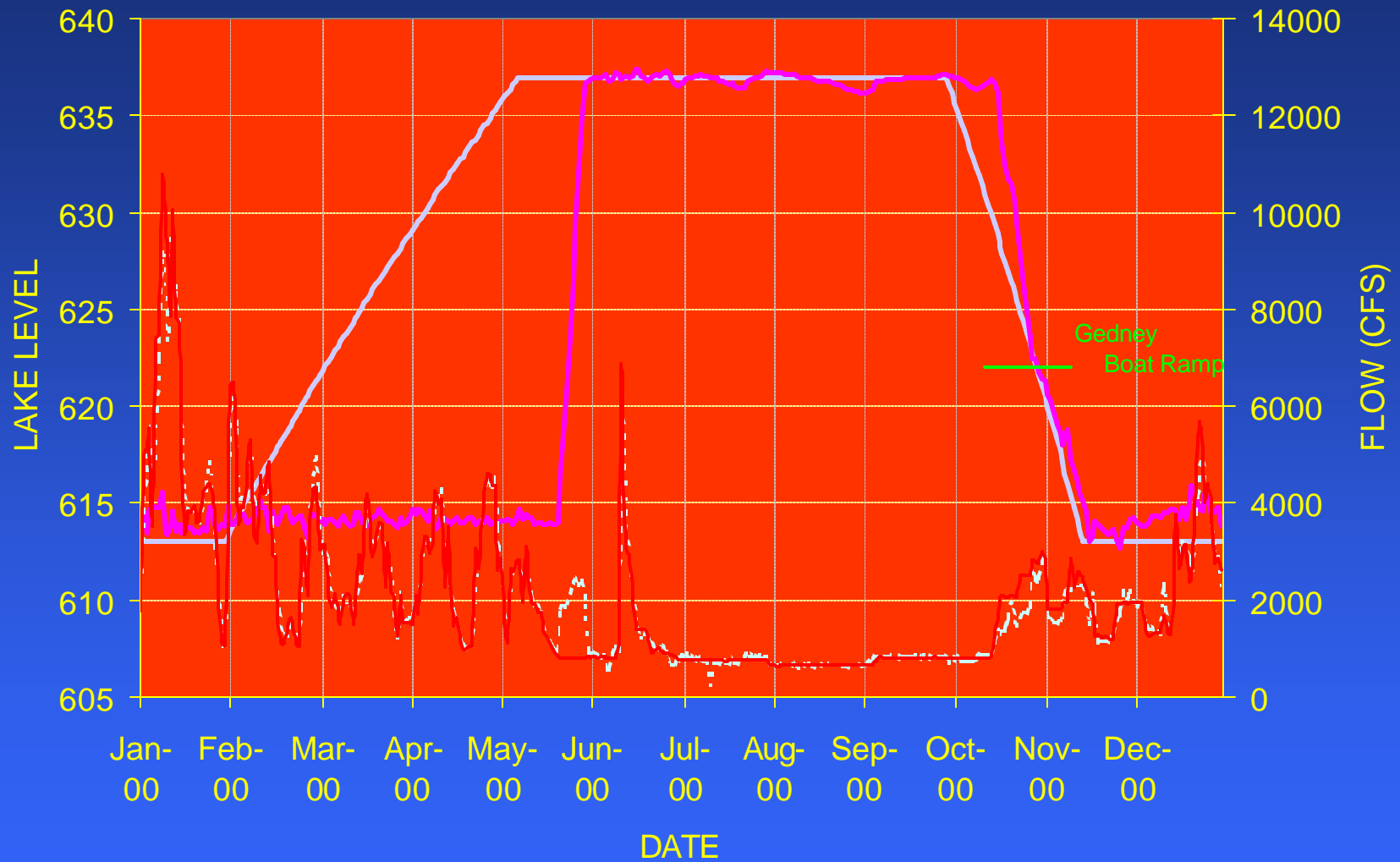


— Rule Curve — Actual Elevation - - - Inflow — Outflow



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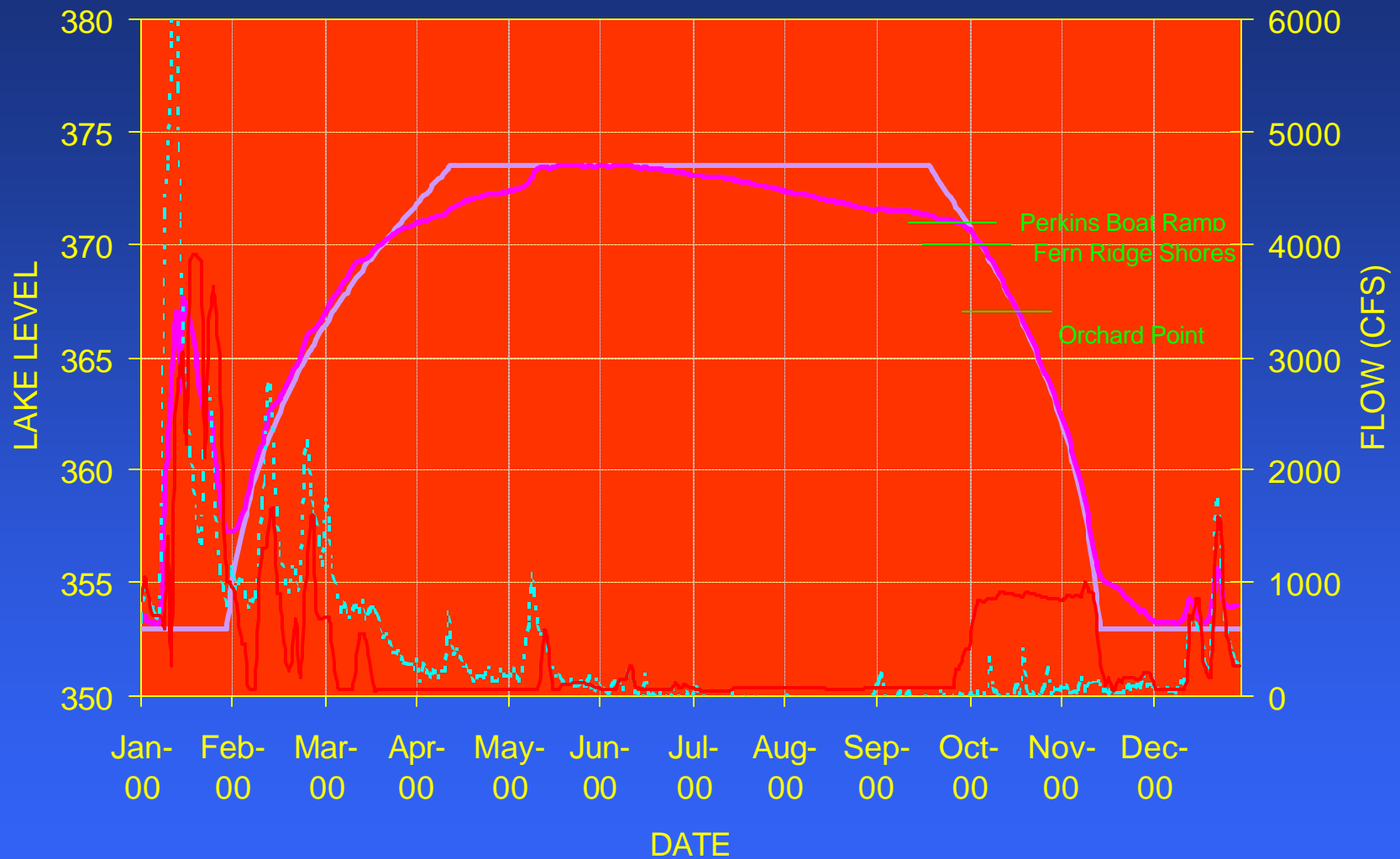
FOSTER



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of Engineers

— Rule Curve — Actual Elevation - - - Inflow — Outflow

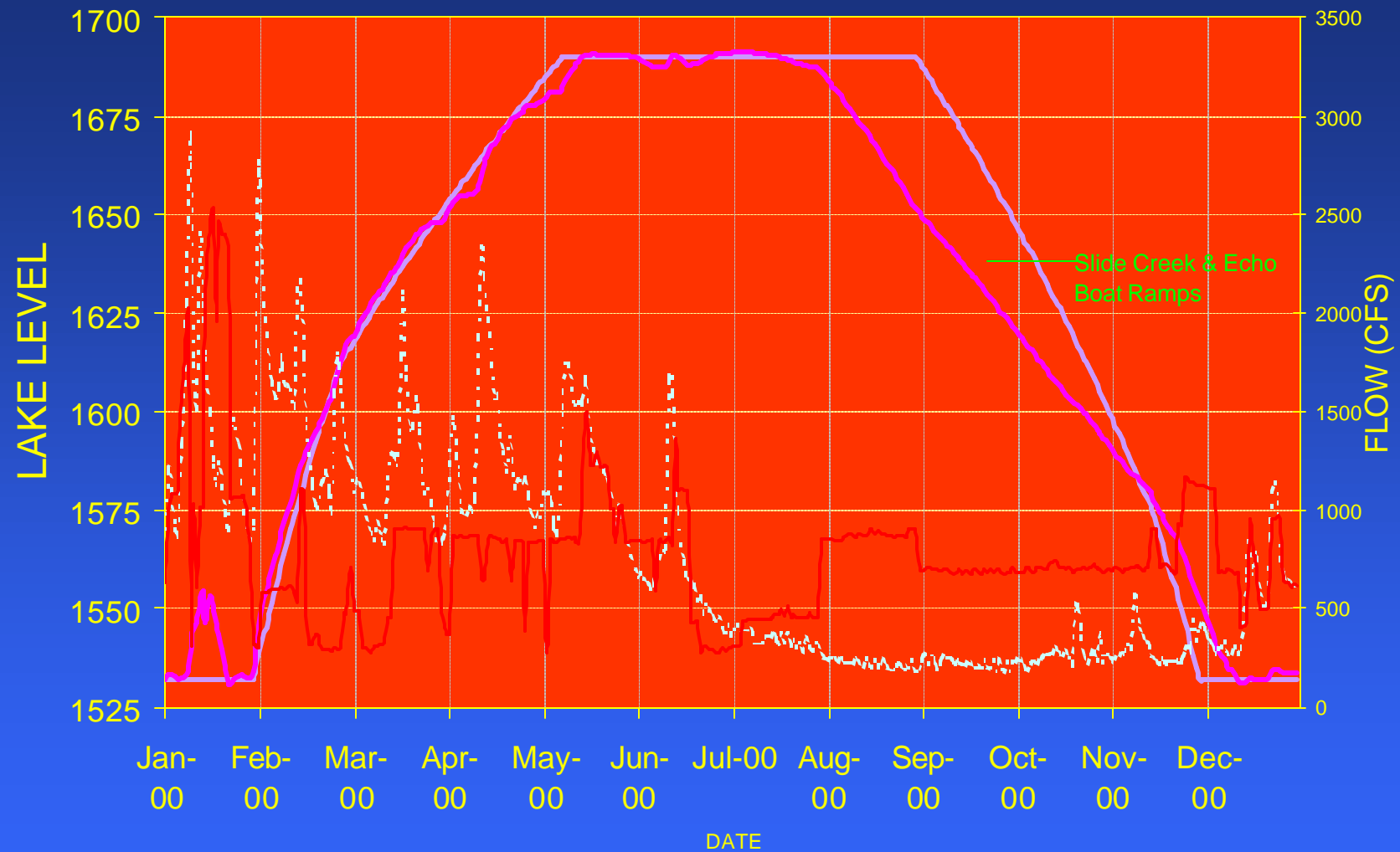
FERN RIDGE



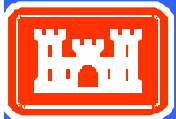
US Army Corps
of Engineers

Rule Curve Actual Elevation Inflow Outflow

COUGAR

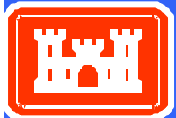
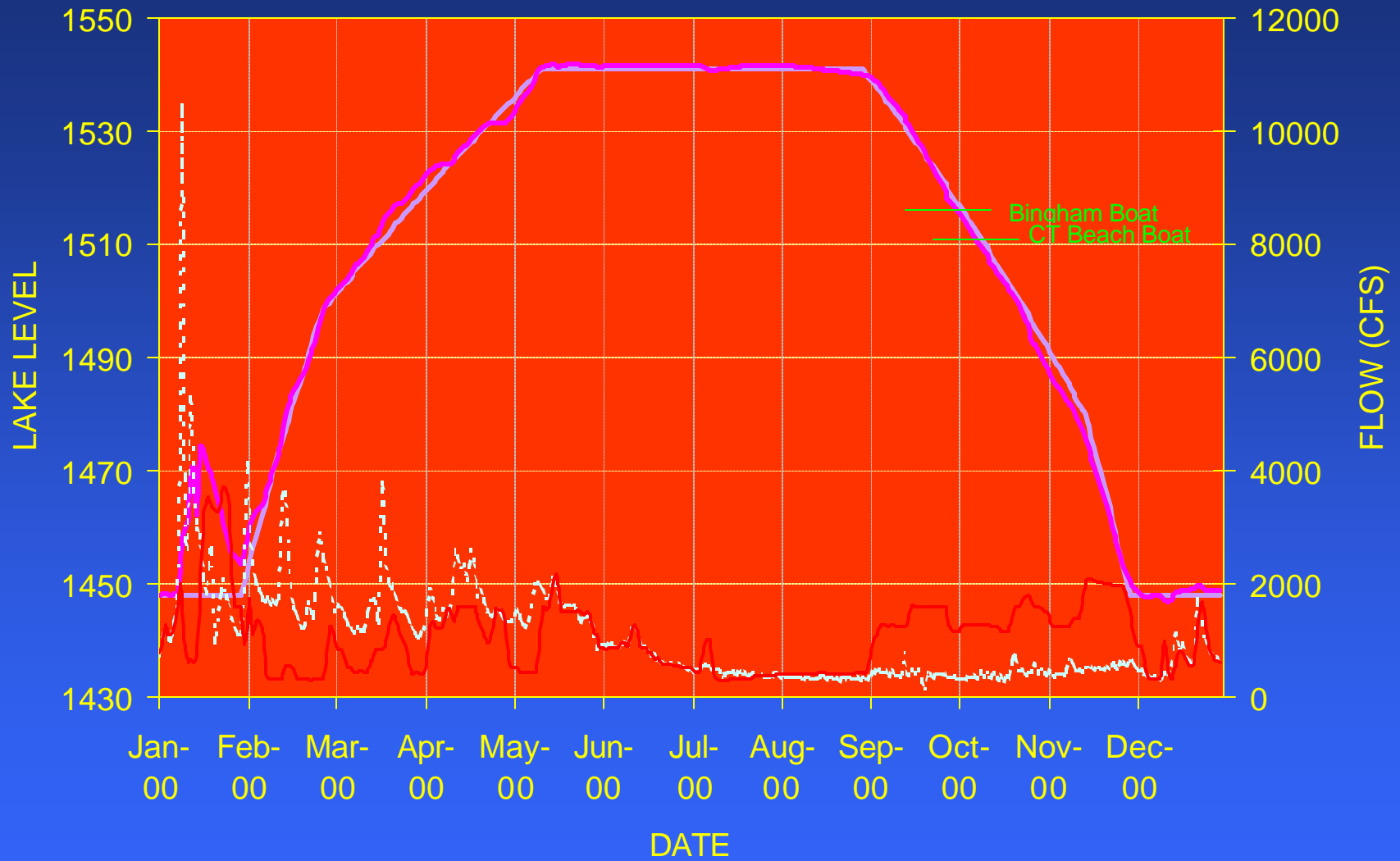


— Rule Curve — Actual Elevation - - - Inflow — Outflow



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of Engineers

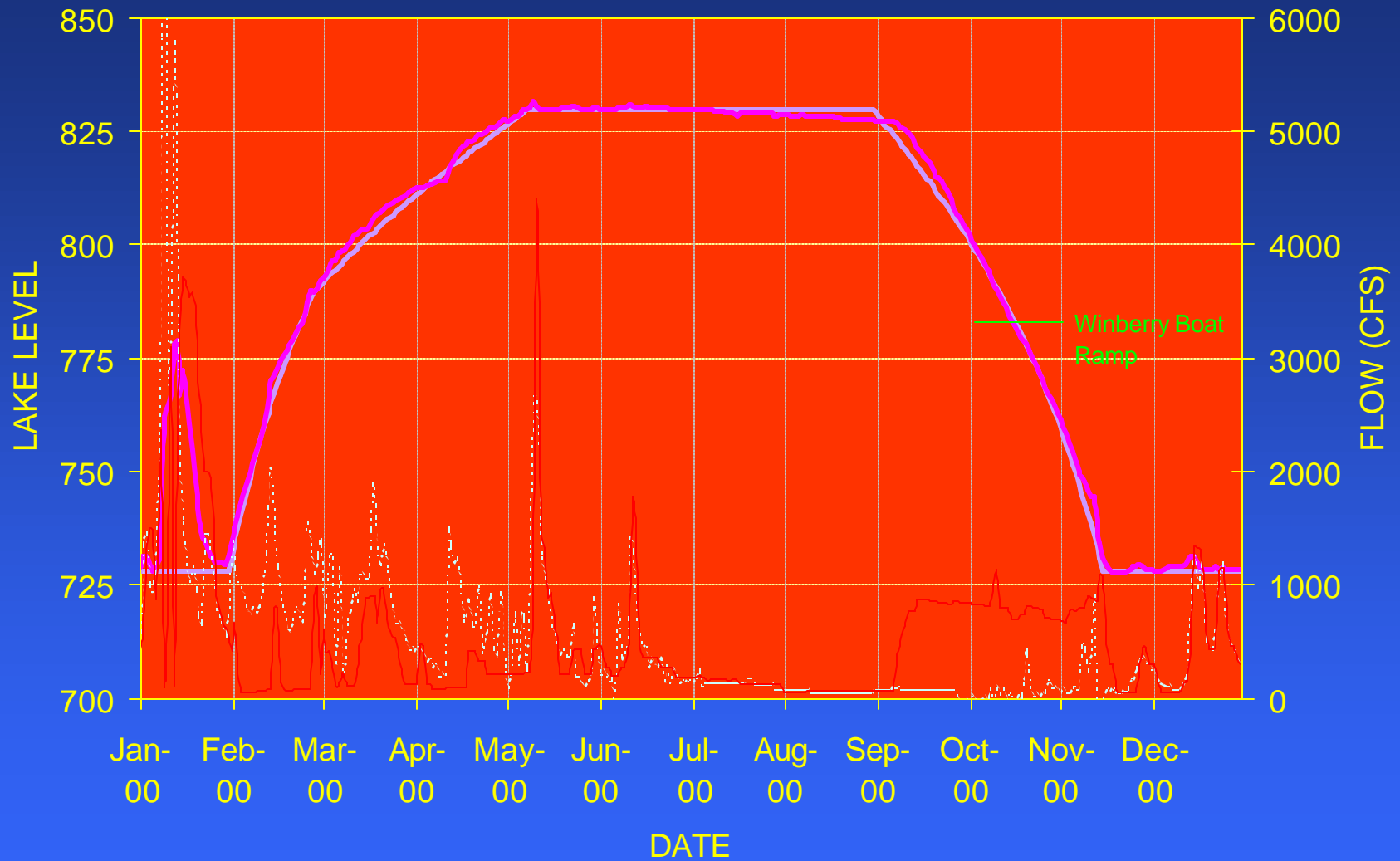
HILLS CREEK



US Army Corps
of Engineers

— Rule Curve — Actual Elevation - - - Inflow — Outflow

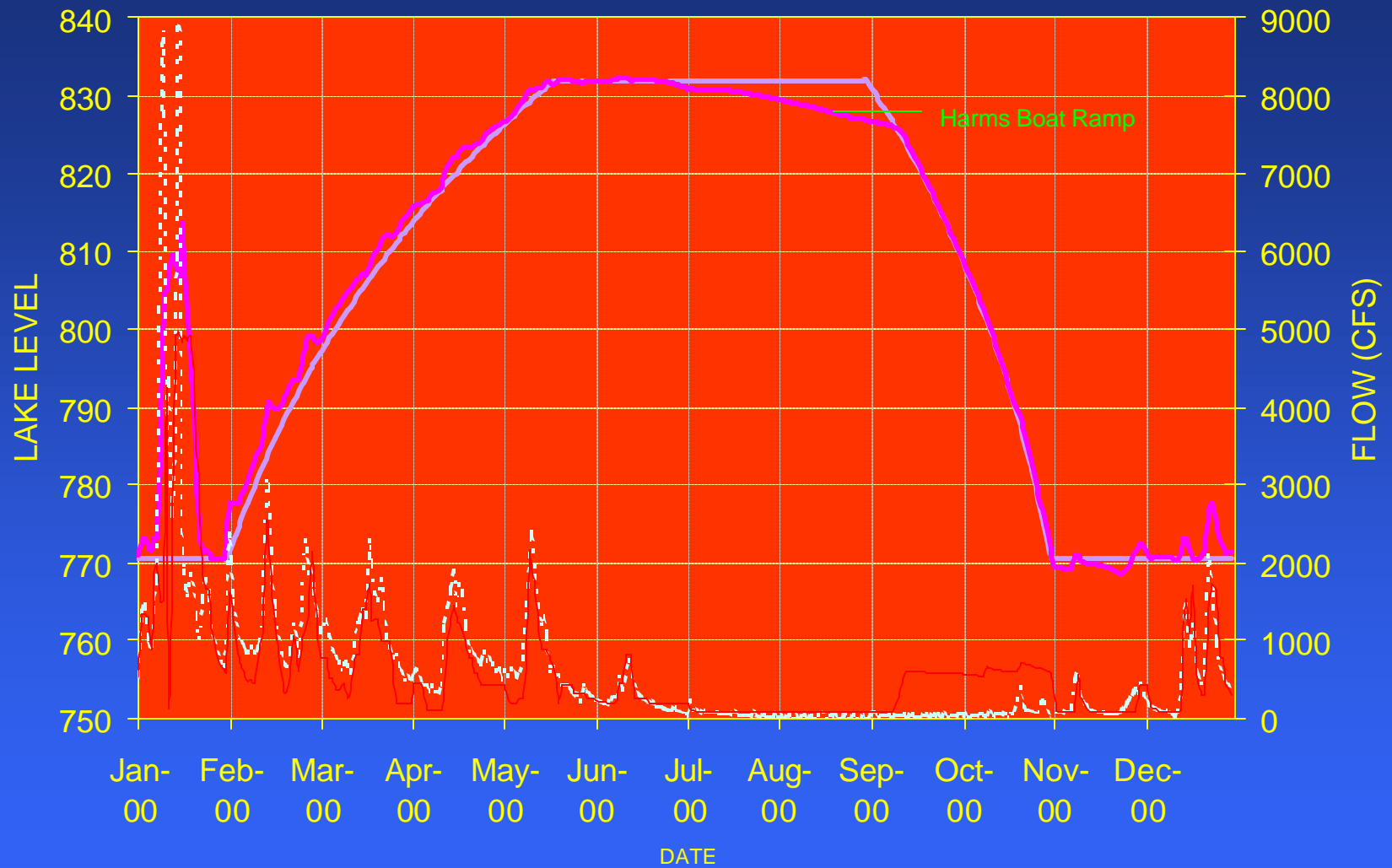
FALL CREEK



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of Engineers

Rule Curve Actual Elevation Inflow Outflow

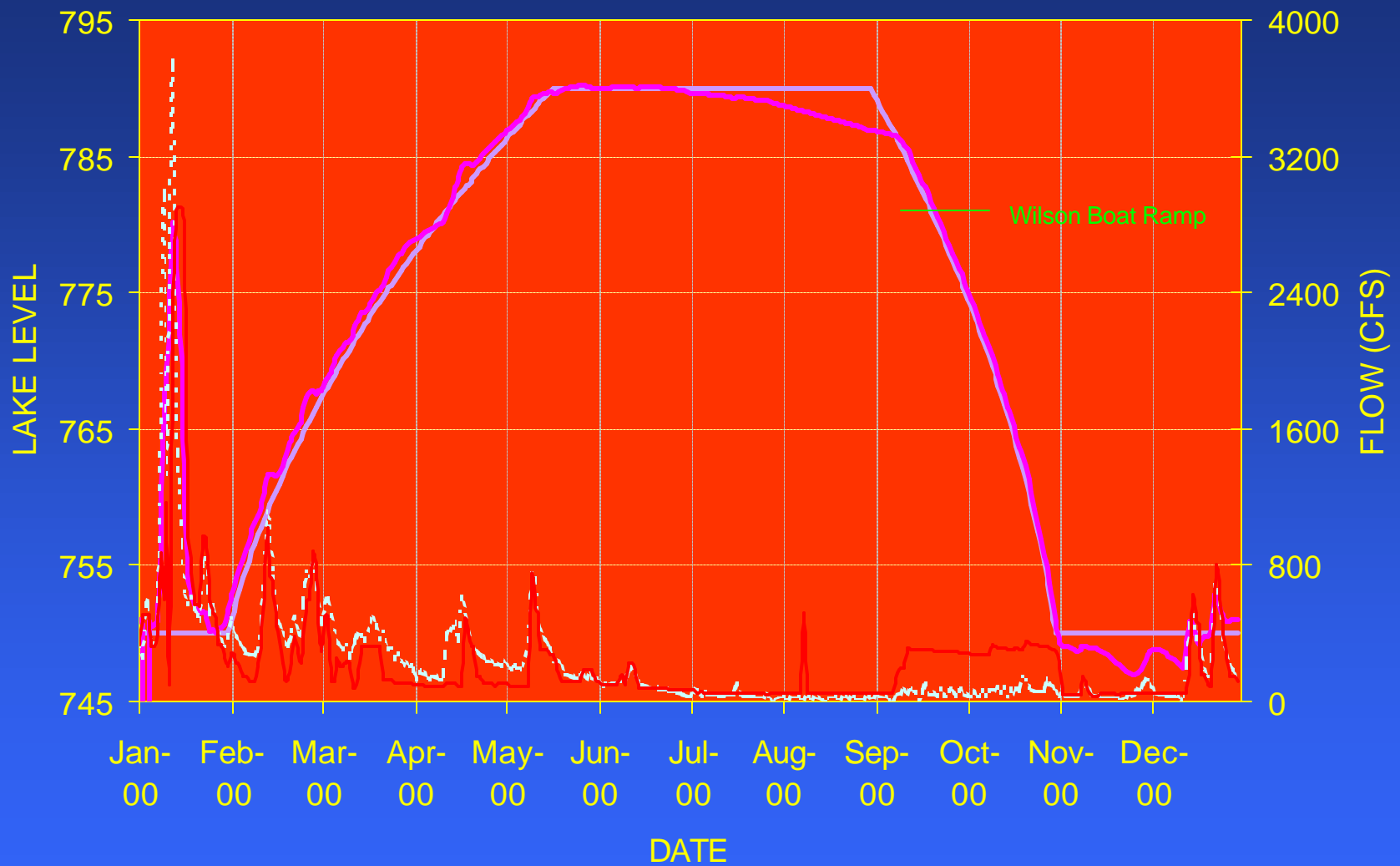
DORENA



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of Engineers

Rule Curve Actual Elevation Inflow Outflow

COTTAGE GROVE

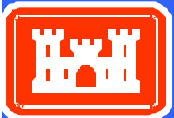


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— Rule Curve — Actual Elevation - - - Inflow — Outflow

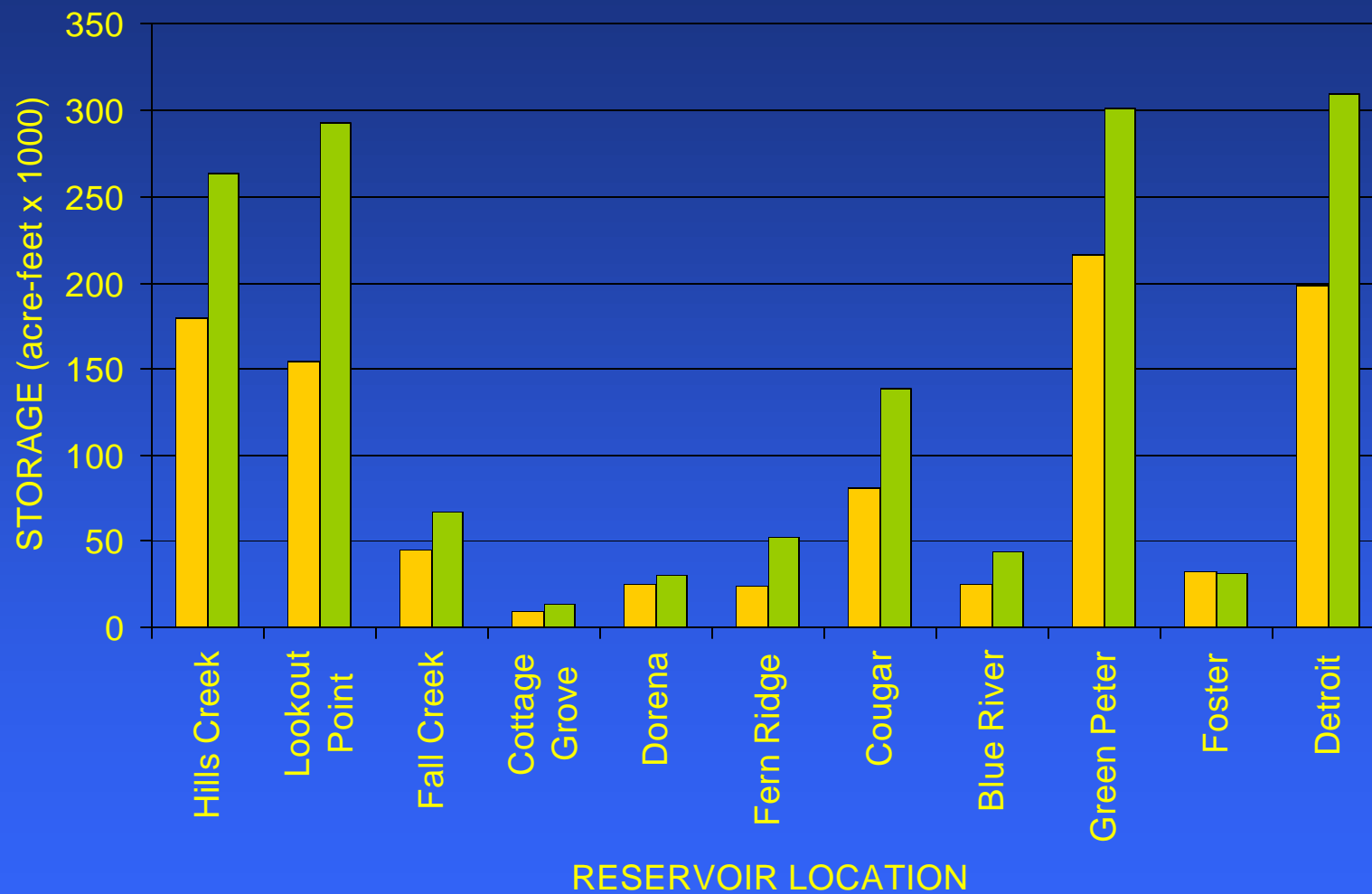
Current Operations (2001)

- ✍ Refill Started 15 January - System was Ten Percent Full by 1 February*
- ✍ All Projects have Maintained Min. Flows to Maximize Refill*
 - ✍ Min. Flows Reduced Below Detroit and Lookout Point*
 - ✍ Power System Emergency in Feb. Resulted in Higher Flows from Green Peter*
 - ✍ The Willamette System is 35 Percent Below the Rule Curve (Equates to 550,000 acre-feet)*
- ✍ February Regulated Flows at Salem were the Second Lowest for the Period of Record (1936-1994)*



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Current Storage (2001)



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■ Actual Storage ■ Required Storage

Proposed 2001 Willamette Operations

 Current Hydrologic Conditions

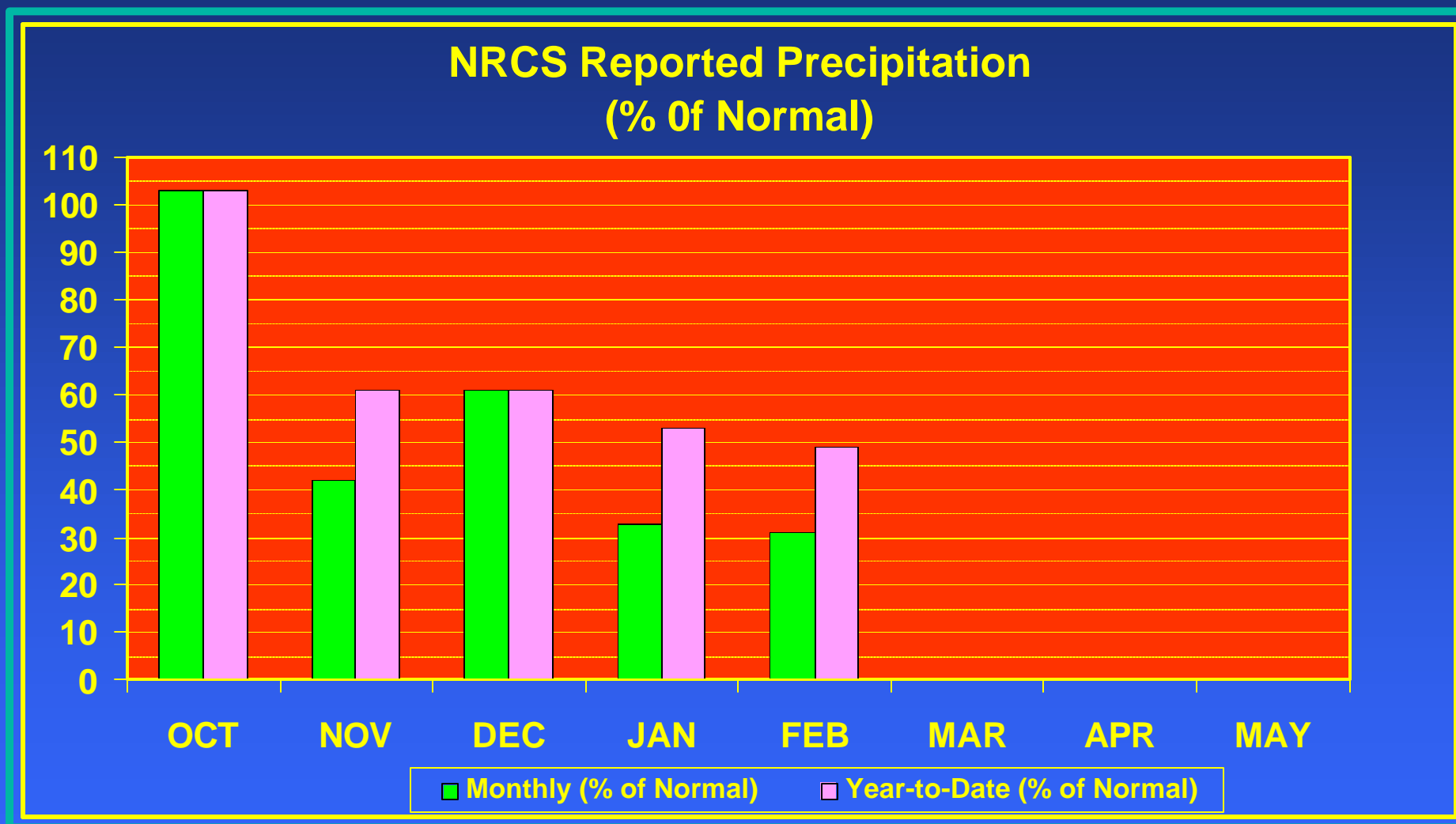
 1 March Water Supply Forecast

 Modeling Results



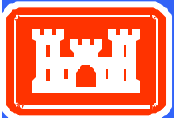
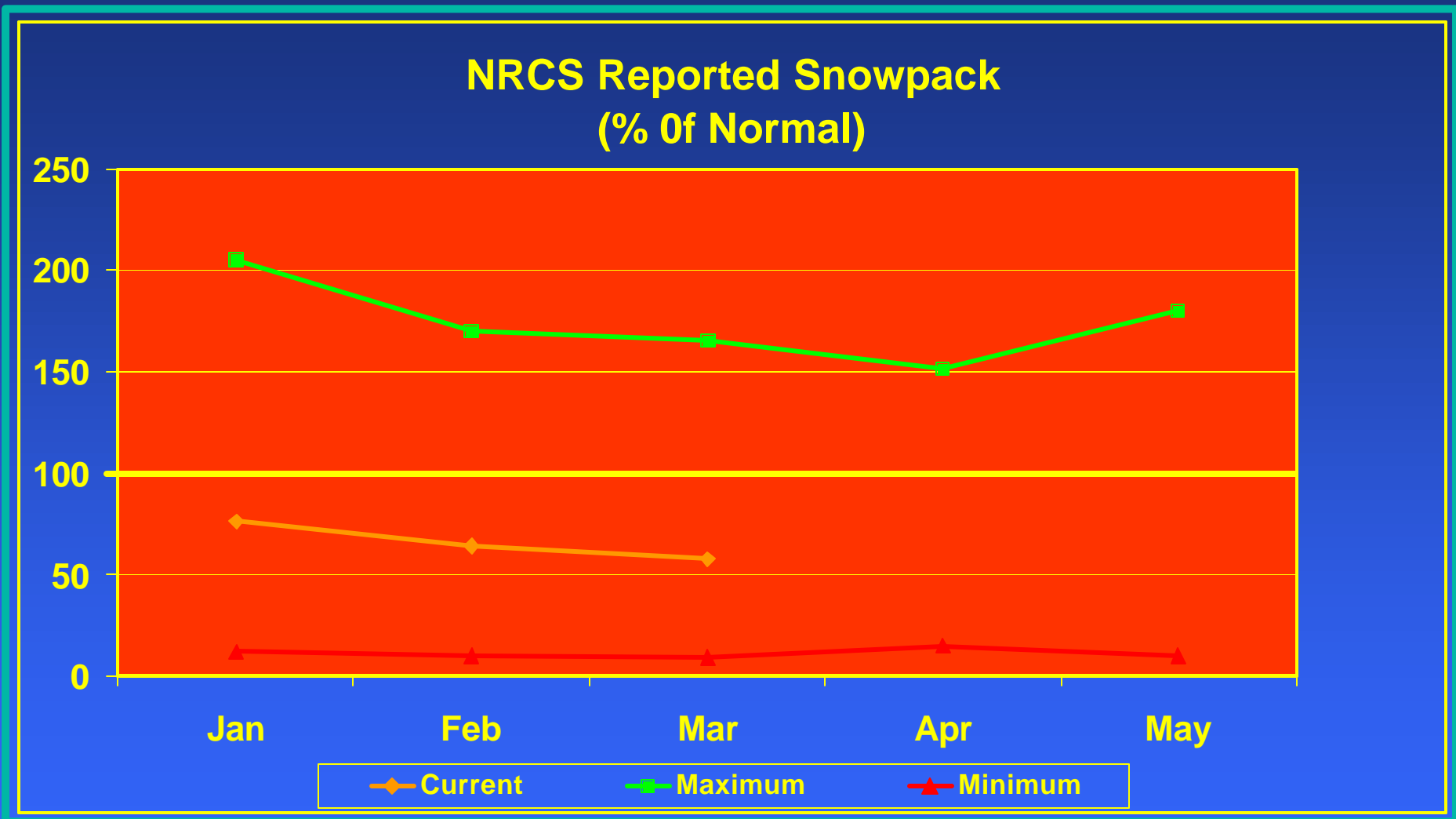
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Current Hydrologic Conditions



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Current Hydrologic Conditions



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Current Hydrologic Conditions

Unreg. Flows - Accum. Vol. (Percent of Avg.)

As Of: 28 Feb 2001

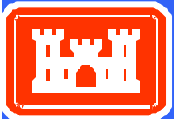
<i>LOCATION</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>	<i>JAN</i>	<i>FEB</i>
<i>McKenzie River @ Vida</i>	<i>87.7</i>	<i>59.8</i>	<i>53.9</i>	<i>49.8</i>	<i>48.0</i>
<i>N. Santiam @ Mehama</i>	<i>93.4</i>	<i>51.3</i>	<i>50.0</i>	<i>45.8</i>	<i>44.2</i>
<i>S. Santiam @ Waterloo</i>	<i>49.3</i>	<i>27.8</i>	<i>36.5</i>	<i>34.1</i>	<i>33.3</i>
<i>Willamette @ Salem</i>	<i>60.0</i>	<i>30.0</i>	<i>32.0</i>	<i>29.0</i>	<i>29.0</i>



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Forecast Analysis

- ✍ Uses a Hydrologic Model of the Willamette Projects & the March NRCS Water Supply Forecast*
- ✍ Simulates the Operation of the 13 Willamette Projects for Period of Record (59 Years)*
- ✍ Operational Criteria Previously Discussed*



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WILLAMETTE RIVER AT SALEM March Forecast Summary Hydrograph



AS OF: 03/08/01

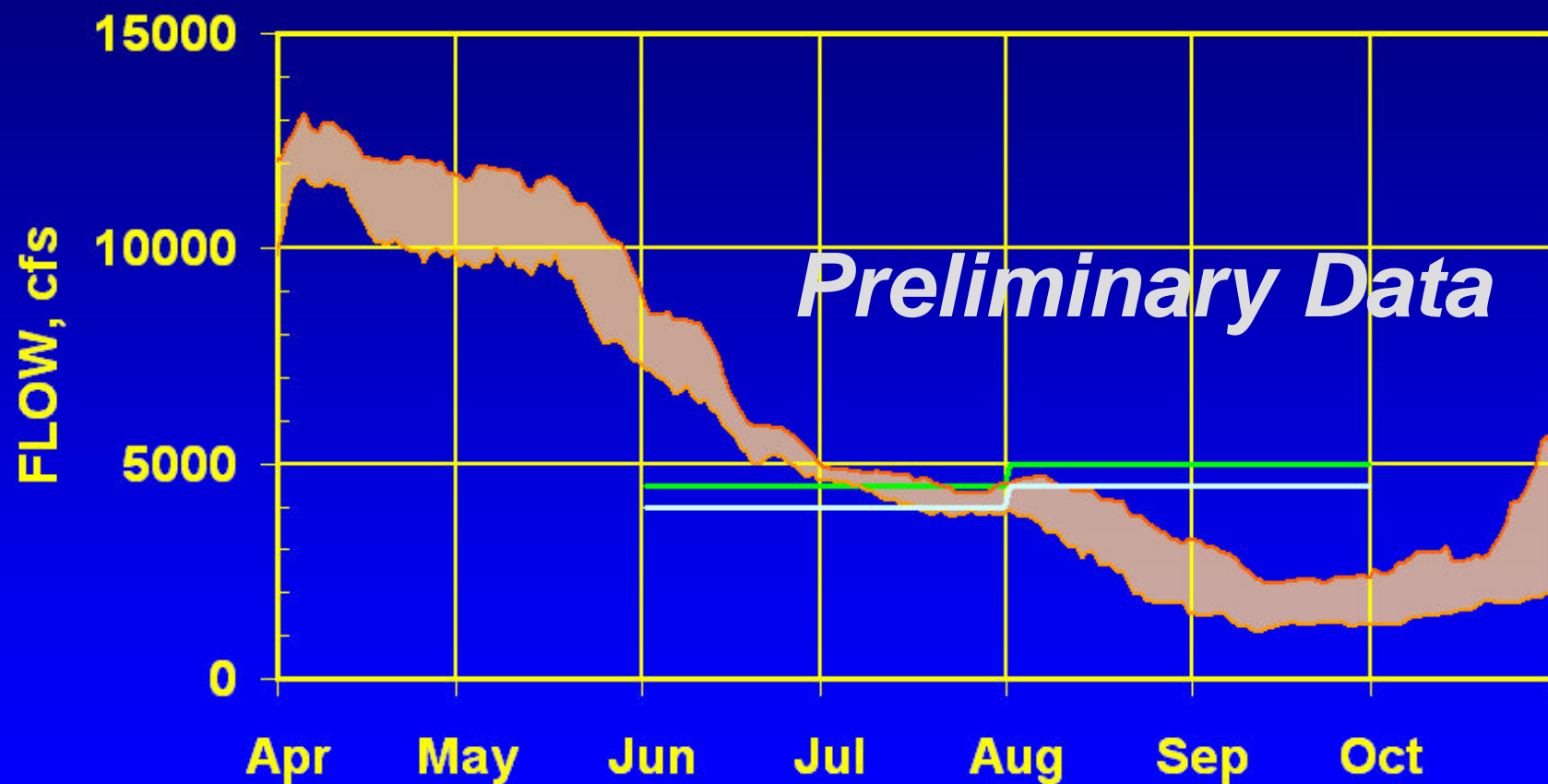
POR 1936-1994



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of Engineers

3/13/2001

WILLAMETTE RIVER AT ALBANY March Forecast Summary Hydrograph



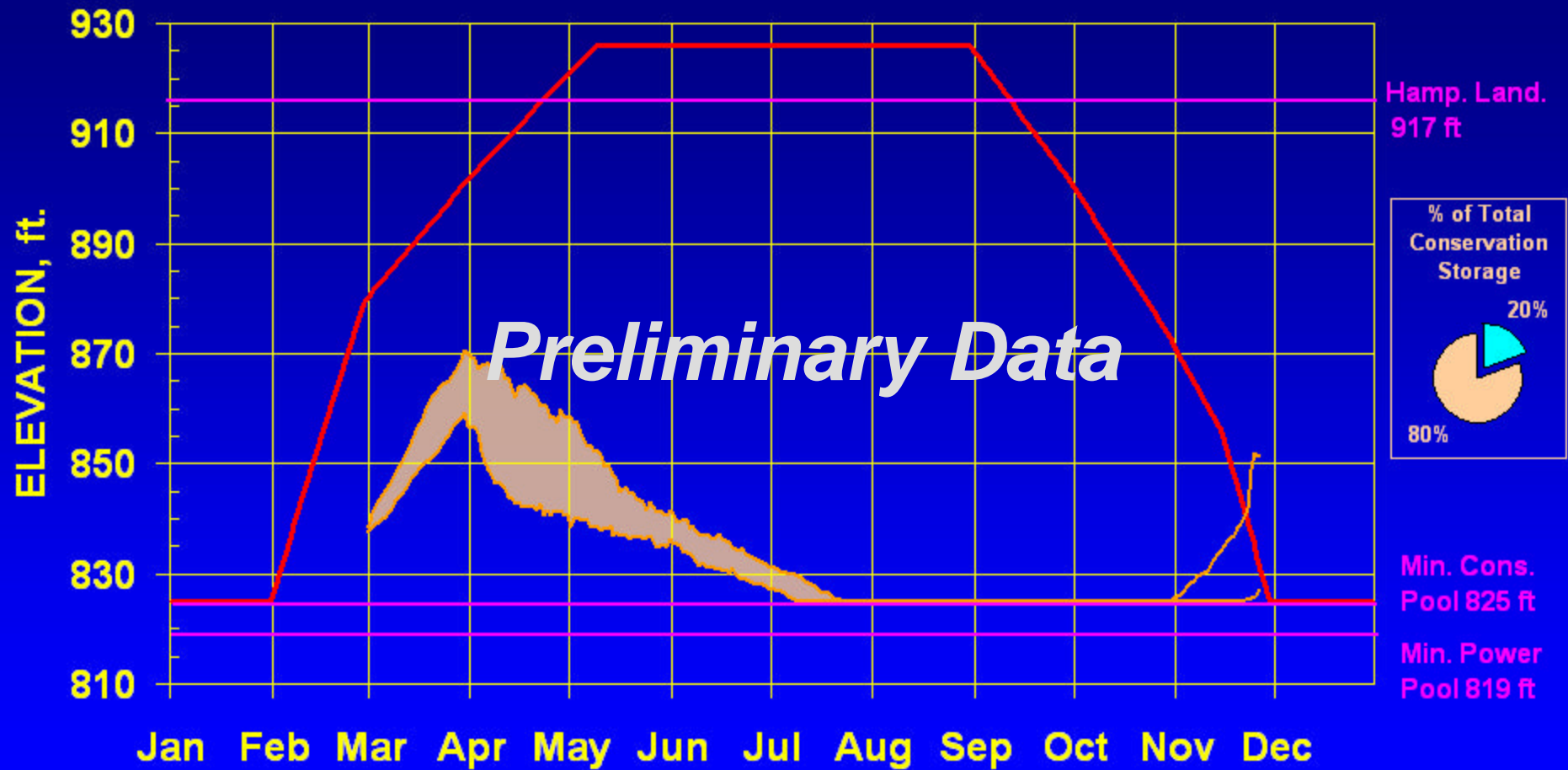
AS OF: 03/08/01

POR 1936-1994



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LOOKOUT POINT Lake Elevation March Forecast Summary Hydrograph



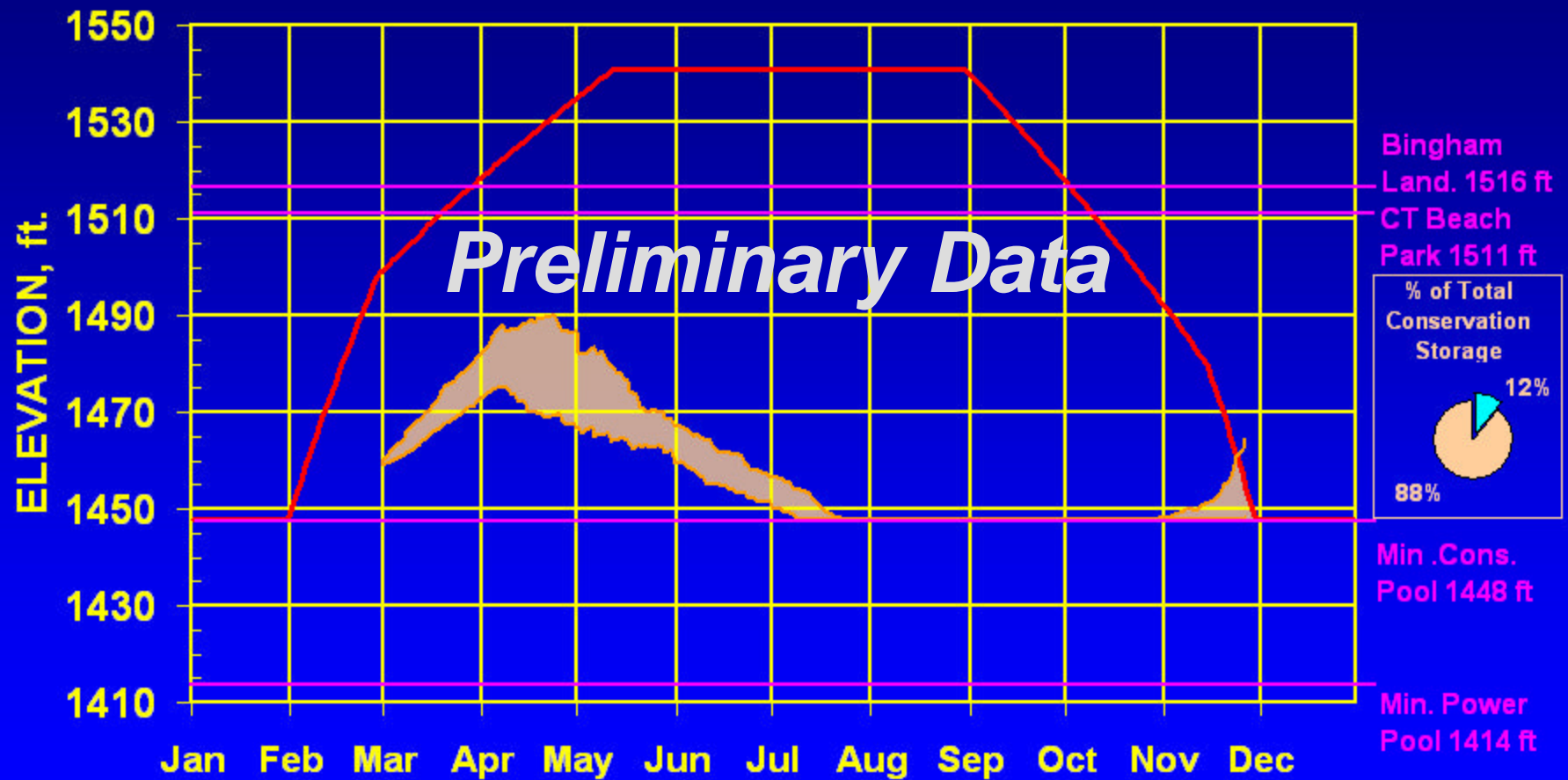
AS OF: 03/08/01

POR 1936-1994



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HILLS CREEK Lake Elevation March Forecast Summary Hydrograph



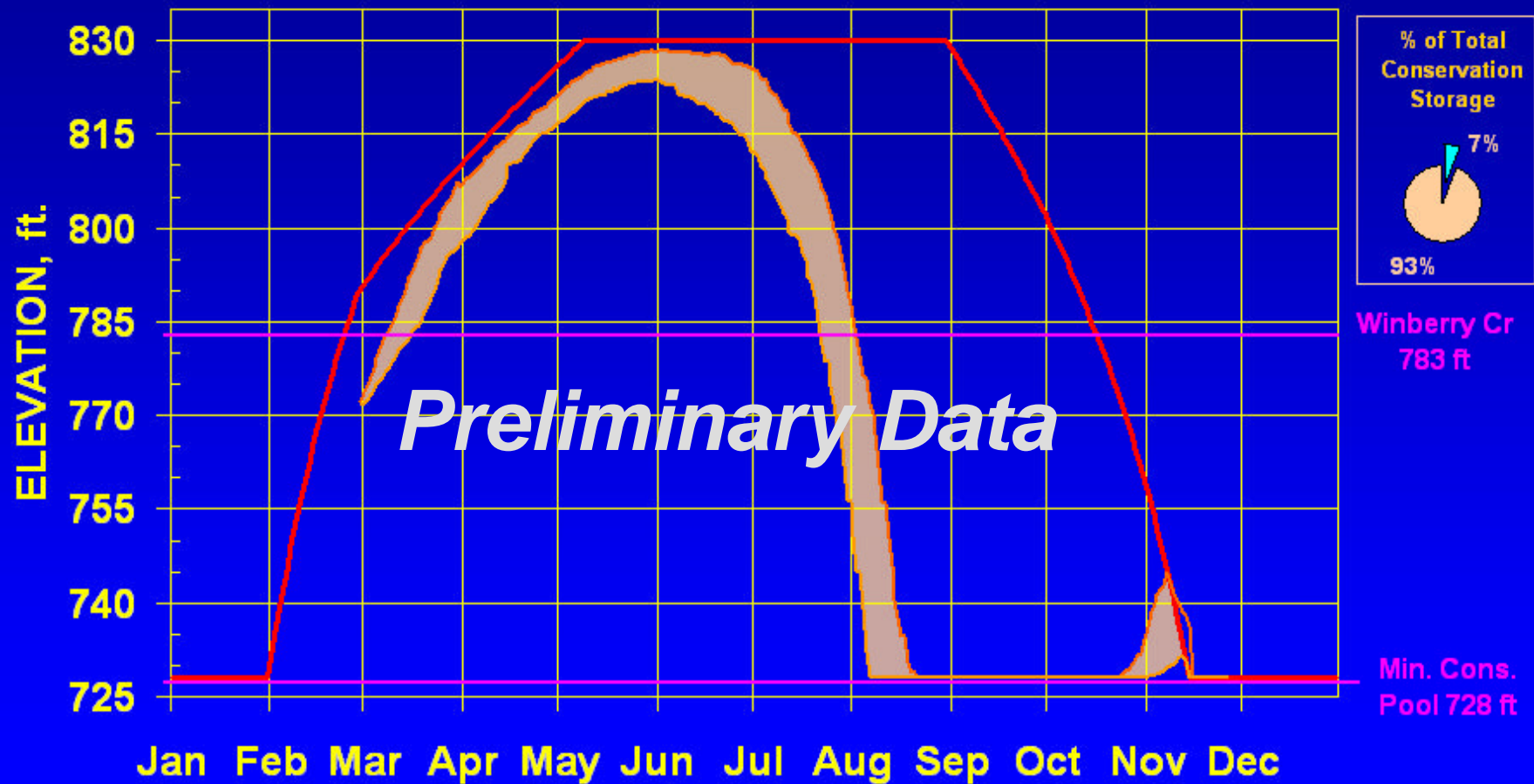
AS OF: 03/08/01

POR 1936-1994



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FALL CREEK Lake Elevation March Forecast Summary Hydrograph



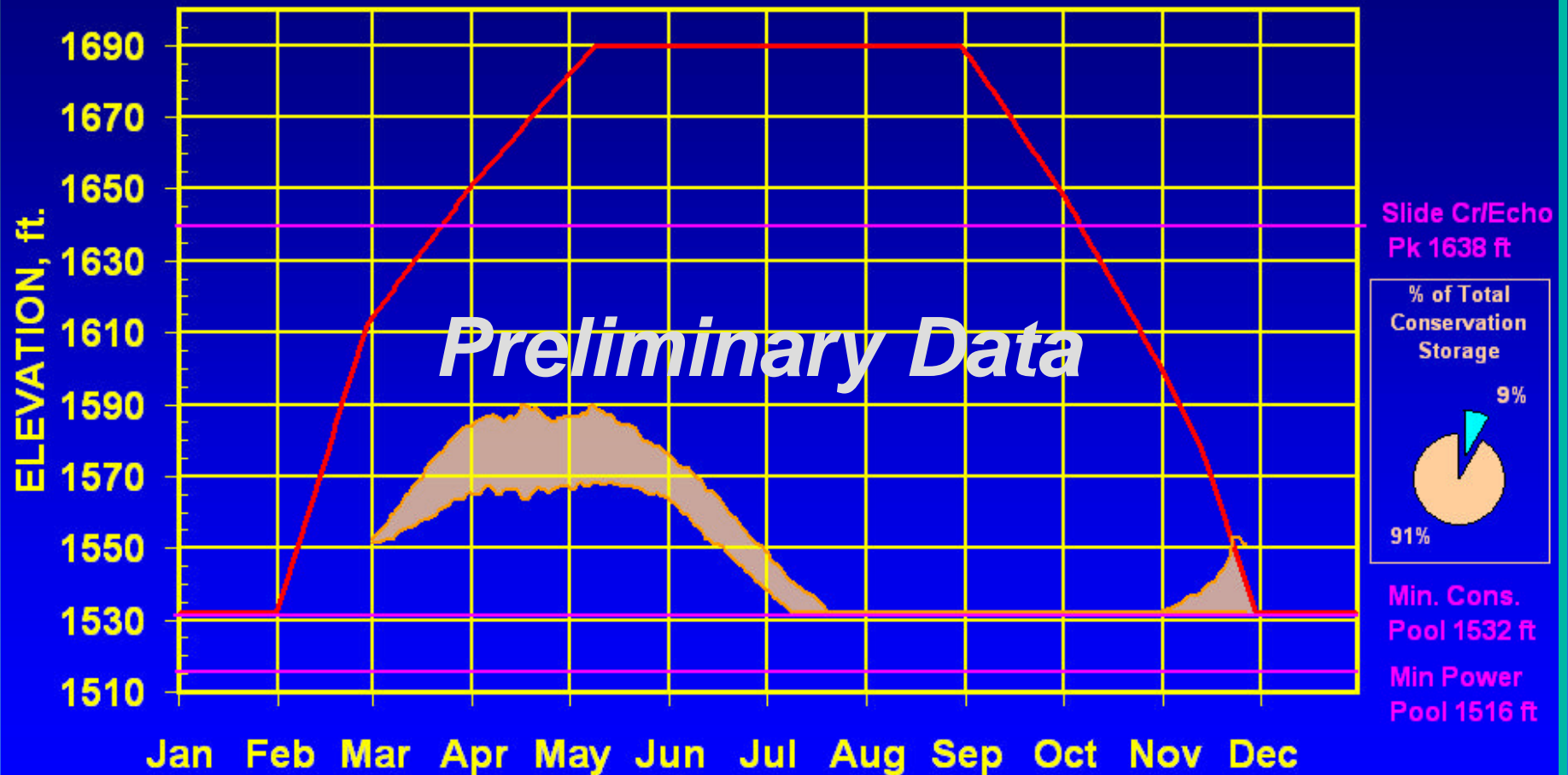
AS OF: 03/08/01

POR 1936-1994



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COUGAR Lake Elevation March Forecast Summary Hydrograph



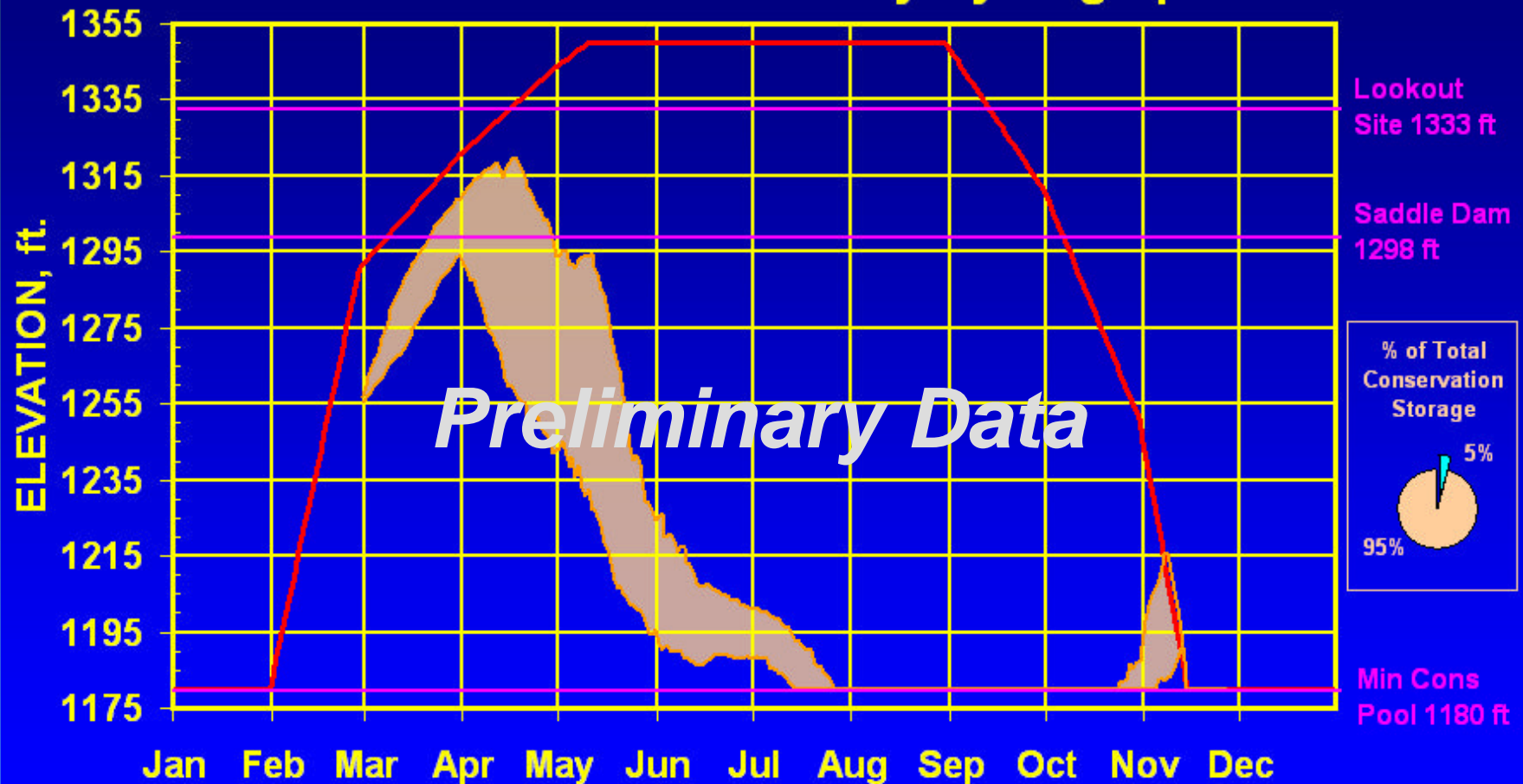
AS OF: 03/08/01

POR 1936-1994



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BLUE RIVER Lake Elevation March Forecast Summary Hydrograph



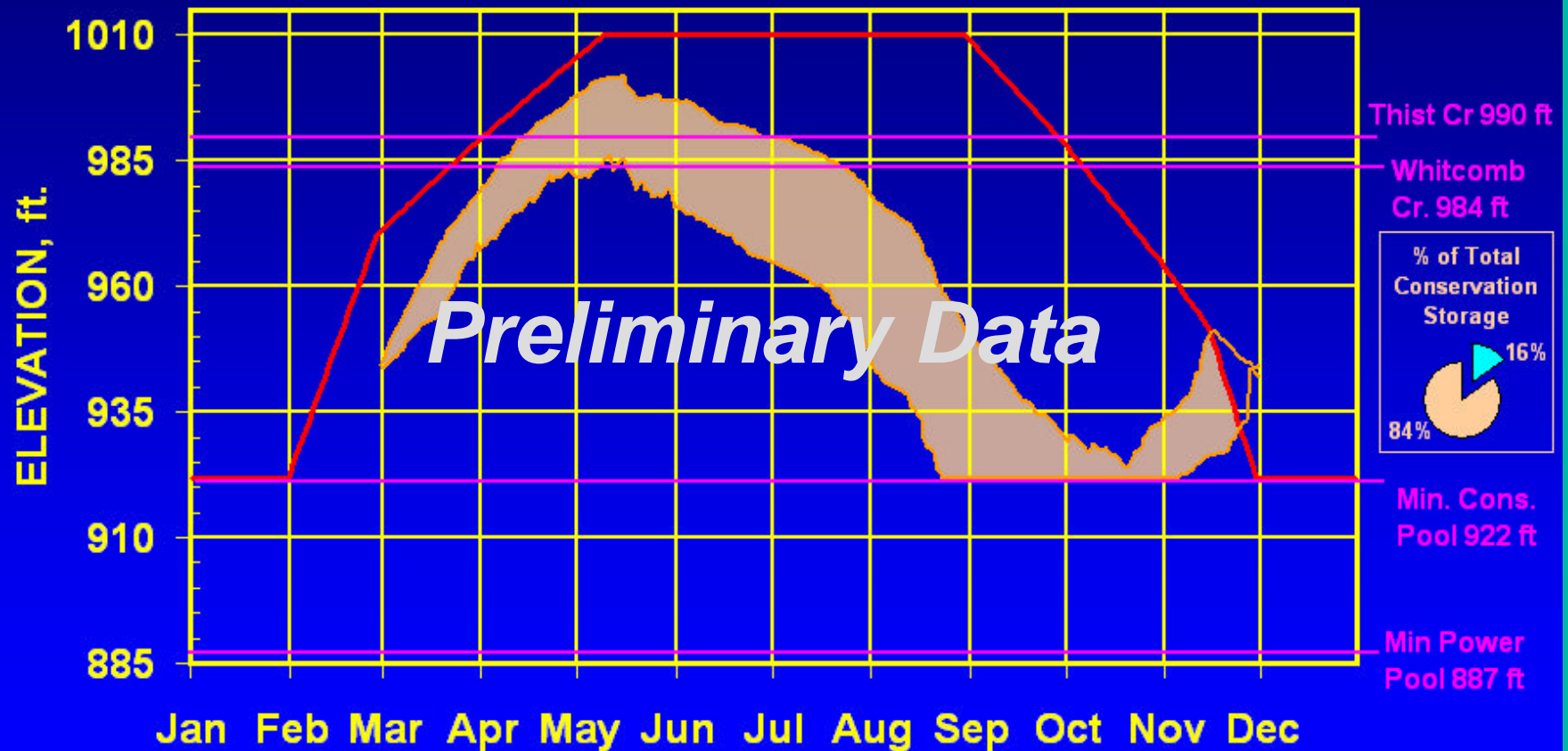
AS OF: 03/08/01

POR 1936-1994



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of Engineers

GREEN PETER Lake Elevation March Forecast Summary Hydrograph



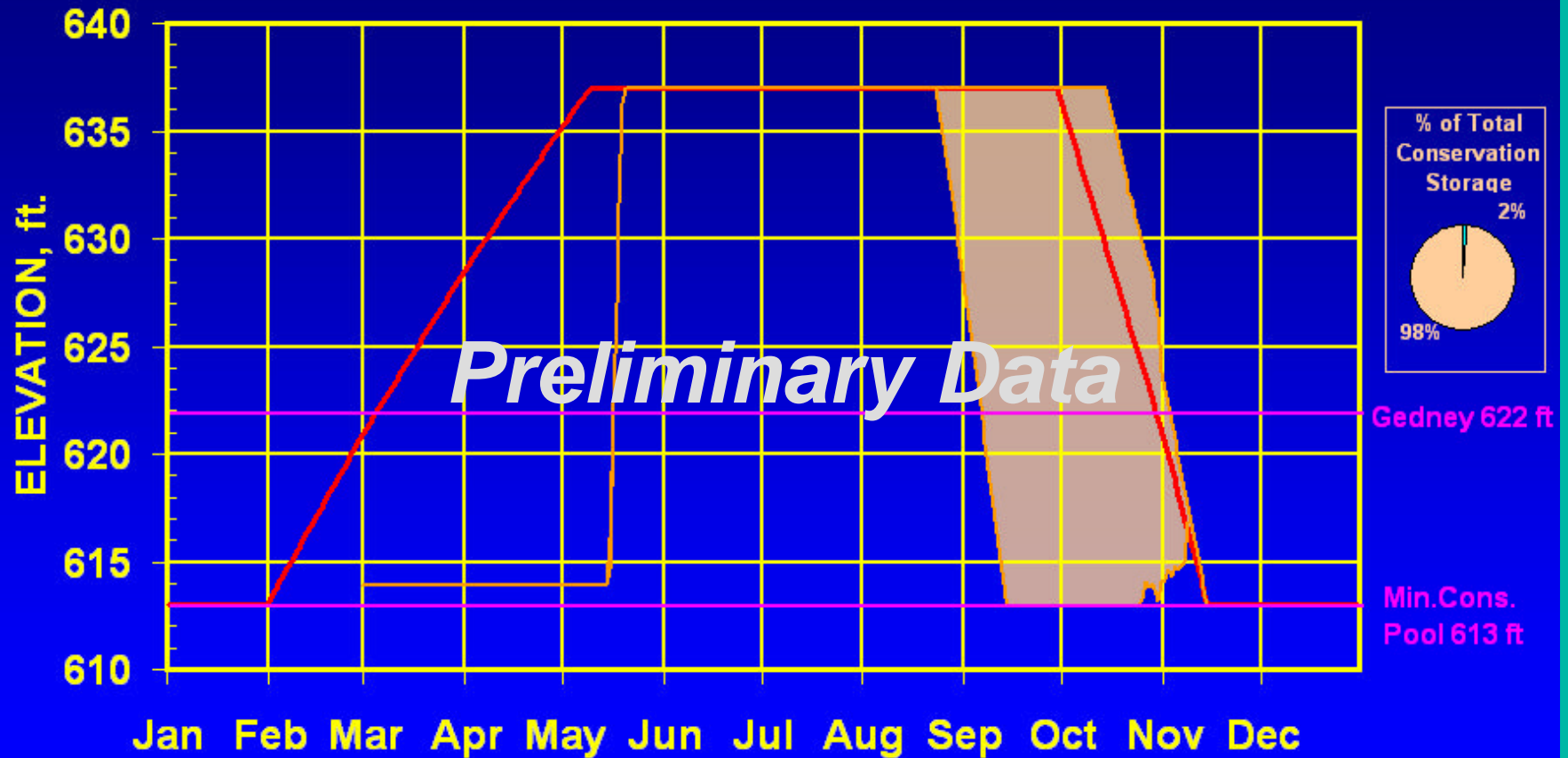
AS OF: 03/08/01

POR 1936-1994



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FOSTER Lake Elevation March Forecast Summary Hydrograph



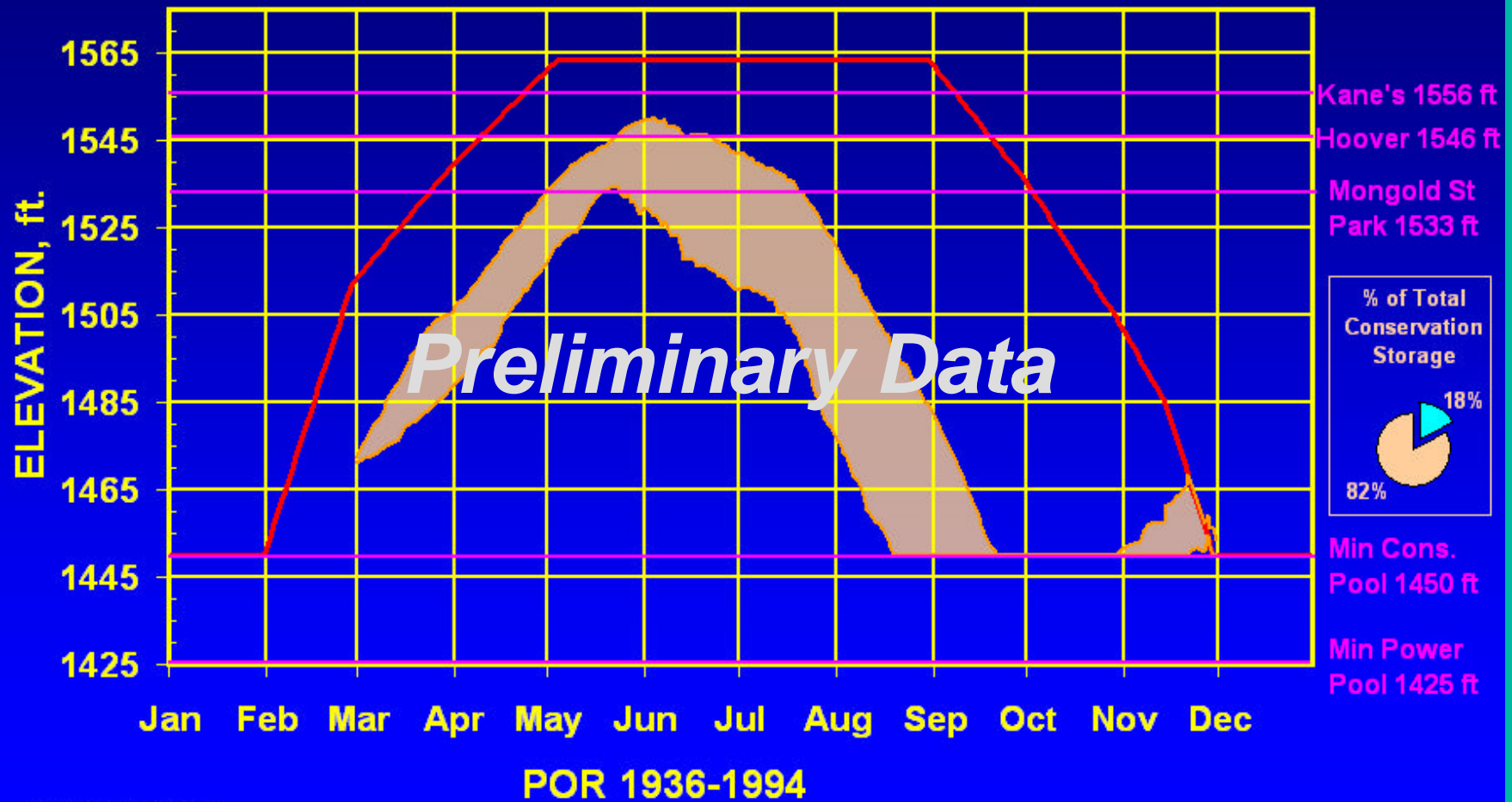
AS OF: 03/08/01

POR 1936-1994



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of Engineers

DETROIT Lake Elevation March Forecast Summary Hydrograph

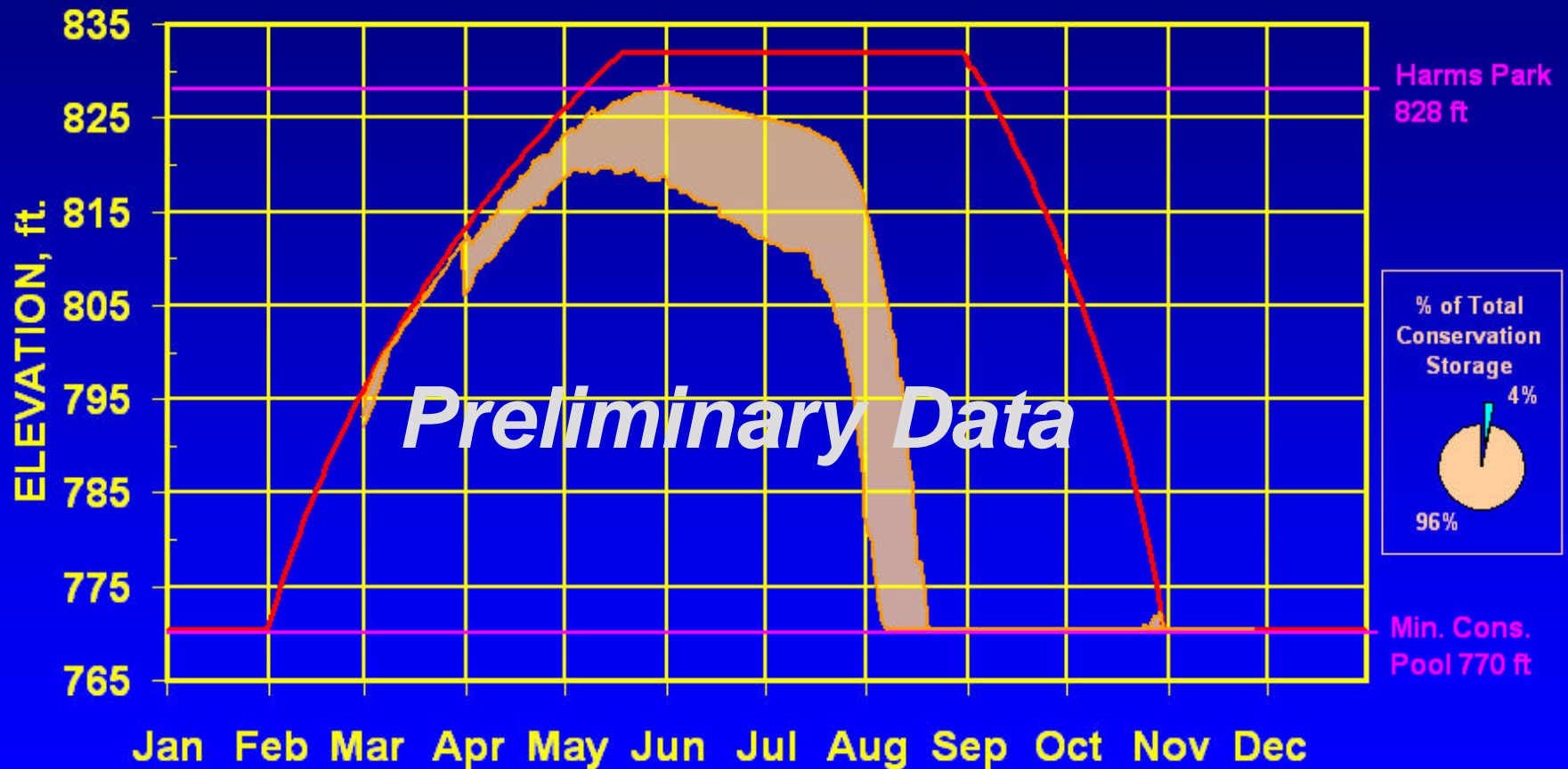


AS OF: 03/08/01



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DORENA Lake Elevation March Forecast Summary Hydrograph



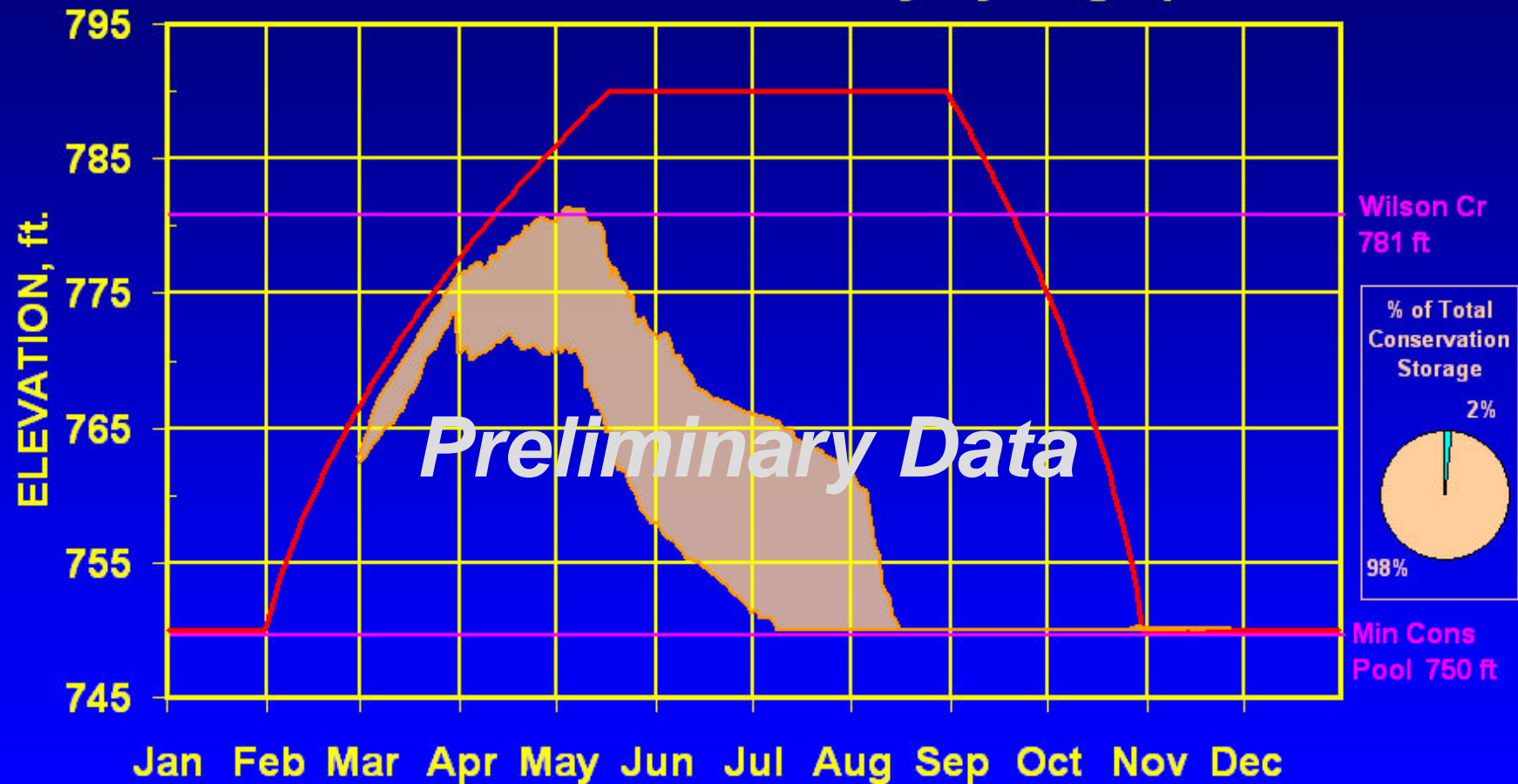
AS OF: 03/08/01

POR 1936-1994



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COTTAGE GROVE Lake Elevation March Forecast Summary Hydrograph



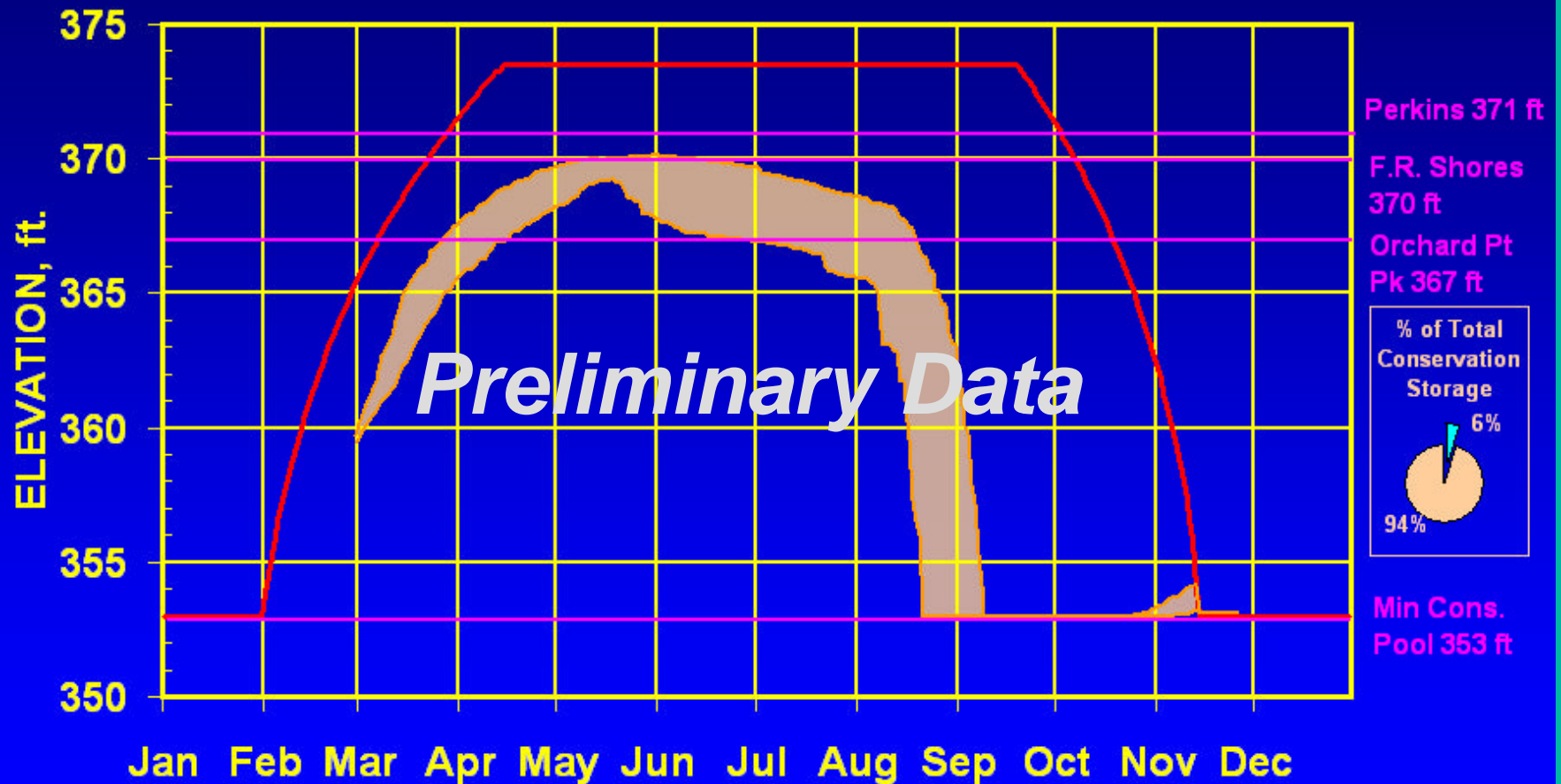
AS OF: 03/08/01

POR 1936-1994



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of Engineers

FERN RIDGE Lake Elevation March Forecast Summary Hydrograph



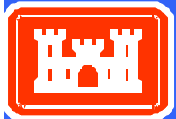
AS OF: 03/08/01

POR 1936-1994



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Questions and Comments



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